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INFLUENCE OF A SPECIFIC HORMONE OF THE PITUITARY ON THE BASAL METABOLISM IN MAN*

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O'DONOVAN and Collip[1] have recently shown that the pituitary of animals contains a metabolic stimulant which appears to be independent of the thyreotrophic, adrenotrophic and growth hormones of the anterior lobe, and, though it is also obtainable from the pars intermedia and the posterior lobe, it is distinguishable from the pressor and oxytocic fractions. Working with animals, these authors showed that this substance increases the consumption of oxygen and production of carbon dioxide, and, according to the respiratory quotients obtained, the increase of expenditure of energy appeared to occur largely at the expense of fat. The active principle was found to be thermostable and resistant to pepsin and alkali. The preparation of the extracts containing this principle has been described,[2] and for the purpose of identification it is, as yet, known as No. 622.

In view of the above observations and the possible use of such a metabolic stimulant in the treatment of obesity and in medicine in general, where such an increase of metabolism is desirable, an attempt was made to determine whether this extract can also increase the rate of metabolism in man.

METHOD OF INVESTIGATION

The preparation used in the clinical experiments to be reported here was previously assayed on rabbits, and 1 c.c. produced a 20 per cent increase of metabolism and a reduction of 0.12 of the respiratory quotient. It contained 2 per cent solids.

As a preliminary test, three subjects were carefully selected, and the consumption of oxygen was determined by the Benedict-Roth apparatus in the strictly basal metabolism state, and, again, ½ hour, 1, 1½, 2, 2½, 3, 4 and 5 hours after intramuscular injection of 5 c.c. of the extract. The results are summarized in Table I.

TABLE I.

SHOWING MAXIMUM INCREASE OF METABOLISM FOLLOWING INTRAMUSCULAR INJECTION OF 5 C.C. PITUITARY EXTRACT NO. 622

	Increase of Metabolism		
Subject	*From*	*To*	*Increase (percentage)*
1.....	− 5	+ 5	10.5
2.....	−17	−12	6.0
3.....	− 3	+10	13.4
	Average.....		10.0

For purpose of brevity there are recorded only in each case (*a*) the metabolism (expressed as percentage of normal) under strictly basal metabolism conditions, and (*b*) the maximum increase above the basal level observed after administration of the extract. It will be noted that the rate of metabolism was increased in all three of the cases. The average increase was 10

TABLE II.

SHOWING MAXIMUM INCREASE OF METABOLISM FOLLOWING INTRAMUSCULAR INJECTION OF 10 C.C. PITUITARY EXTRACT NO. 622

	Increase of Metabolism		
Subject	*From*	*To*	*Increase (percentage)*
1.....	−11	+ 8	21.3
2.....	− 6	+11	18.1
3.....	+ 1	+18	16.8
4.....	−12	+12	27.2
	Average.....		20.8

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per cent above that noted before the administration of the extract.

The above experiments were repeated in four other subjects with 10 c.c. of the extract. The results are summarized in Table II. It will be noted that the consumption of oxygen was again increased in all of the subjects, but to a definitely higher level; the average was 20.8 per cent above that observed prior to the administration of the extract.

INFLUENCE OF THE EXTRACT UPON THE RESPIRATORY QUOTIENT

In order to determine whether the increase of heat-production in the human body occurs to an appreciable extent at the expense of fat, as was suggested by the experimental work on animals, it was obviously necessary to include in the measurements carbon dioxide production as well as oxygen consumption, that is, to determine the effect of the extract upon the respiratory quotient.

METHODS

There are many necessary precautions to be taken in order to be reasonably certain that the respiratory quotient obtained at the mouth approximates reasonably accurately the respiratory quotient in the tissues, that is, true metabolic conditions. The method of determining the protein metabolism also depends upon a number of conditions. The precautions which must be taken—technical, psychological, etc.—in respiratory quotient studies and the necessary calculations for the protein metabolism have been dealt with by one of us (R.) elsewhere.[3, 4, 5, 6] It is, therefore, unnecessary to repeat them here.

In the strictly fasting state the respiratory quotient tends to approximate that of fat. In order to determine whether this pituitary extract does or does not increase the metabolism to any extent at the expense of fat, it was therefore obviously necessary to use some method other than determination of the respiratory quotient alone after administration of the extract. Also it is a well-known fact that the respiratory quotient increases very rapidly and is maintained at a high level for 2 to 3 hours after administration of glucose. The procedure, therefore, consisted of a comparison of the respiratory quotients obtained after oral administration of glucose with those obtained after administration of a similar amount of glucose orally and injection of 10 c.c. of the extract intramuscularly.

TABLE III.

SHOWING AVERAGE RESPIRATORY QUOTIENTS BEFORE AND AFTER ORAL ADMINISTRATION OF 50 GRAMS GLUCOSE ALONE AND 50 GRAMS GLUCOSE ORALLY AND 10 C.C. PITUITARY EXTRACT NO. 622 INTRAMUSCULARLY

			Hours after administration of glucose							
Test	*No.*	*Basal*	*0.5*	*1.0*	*2.0*	*3.0*	*4.0*	*5.0*	*6.0*	*7.0*
Glucose	6	0.755	0.842	0.870	0.888	0.902				
Glucose + Extract	6	0.730	0.771	0.784	0.806	0.812	0.807	0.783	0.736	0.728

The results expected with glucose alone are well known.[7] The respiratory quotient rarely fails to increase within 30 minutes, and the low, high and average increases are 0.07, 0.17 and 0.12, respectively. In Table III are shown the average values of six tests in each of which the respiratory quotient was obtained before and, again, ½, 1, 2 and 2½ hours after oral administration of 50 grams of glucose. To determine the effects of the extract, the respiratory quotient was first obtained in the strictly fasting state. Fifty grams of glucose were then given by mouth and the respiratory quotient was again determined 30 minutes later. Ten c.c. of the extract were then injected intramuscularly and the respiratory quotient was determined ½, 1, 2, 3, 4, 5, 6 and 7 hours later. The average results of six experiments are also summarized in Table III.

It will be noted that following the administration of the extract plus glucose the increase of the respiratory quotient was definitely lower than with the glucose alone; whereas, the maximum increase of the respiratory quotient with the glucose alone was 0.147, that with the glu-

cose and extract was 0.082 only. The findings in man thus agree, in general, with the animal experiments, which indicate that the increase of metabolism following administration of the extract occurs to a large extent at the expense of fat.

TABLE IV.

SHOWING INCREASE OF METABOLISM FOLLOWING ORAL ADMINISTRATION OF 50 GRAMS GLUCOSE AND INTRAMUSCULAR INJECTION OF 10 C.C. PITUITARY EXTRACT NO. 622

	Increase of metabolism		
Subject	*From*	*To*	*Increase (percentage)*
1.....	− 3	+25	28.8
2.....	− 1	+28	29.1
3.....	− 6	+11	18.0
4.....	−12	+12	27.2
5.....	−10	+12	24.4
6.....	−19	+ 9	34.5
	Average.....		27.0

INFLUENCE OF THE EXTRACT UPON THE SPECIFIC DYNAMIC ACTION OF GLUCOSE

In Table IV are shown the increases of metabolism noted in the above-mentioned six experiments with the glucose plus the extract. The data when compared with those shown in Table II suggest that there was a summation effect, namely, (*a*) an increase of metabolism due to the specific dynamic action of the glucose, and (*b*) an increase of metabolism due to the extract. More definite evidence that the extract does not interfere with the specific dynamic action of glucose may be seen in the results of two experiments summarized in Table V. It will be noted that, after deducting the average increase of metabolism due to the specific dynamic action of the glucose, namely, 12.6 per cent, the average increase of the total metabolism (29.5 per cent) still allows for a 17 per cent increase of metabolism due to the extract. The latter, it will be noted, fits in with the effect of the extract alone shown in Table II.

TABLE V.

SHOWING SUMMATION OF EFFECT OF SPECIFIC DYNAMIC ACTION OF 50 GRAMS GLUCOSE ORALLY AND 10 C.C. PITUITARY EXTRACT NO. 622 INTRAMUSCULARLY

	Experiment 1			*Experiment 2*		
	Increase of metabolism			*Increase of metabolism*		
Test	*From*	*To*	*Increase (percentage)*	*From*	*To*	*Increase (percentage)*
Glucose + Extract	−10	+12	24.4	−19	+9	34.5
Glucose	− 7	+ 3	10.7	−11	+2	14.6
Difference			13.7			19.9

SUMMARY

A new extract of the pituitary, presently known as No. 622, and found by O'Donovan and Collip to increase the metabolism of animals, was also found to increase the rate of metabolism in man.

As in animals, respiratory-quotient studies show that the increase of metabolism occurs to an appreciable extent at the expense of fat.

When glucose and the extract were administered within 30 minutes of each other there was evidence that the increase of metabolism due to the extract did not interfere with the specific dynamic action of the glucose.

In view of the above findings, the possible uses of this extract in the treatment of obesity and in conditions in general where an increase of metabolism is desirable are now being investigated.

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REFERENCES

1. (*a*) O'DONOVAN, D. K. AND COLLIP, J. B.: The melanophore hormone and a thermostable metabolic stimulant in pituitary extracts, *Am. J. Physiol.*, 1938, 123: 157.
   (*b*) *Idem*: The thermostable metabolic stimulant in pituitary extracts and its relation to the melanophore-expending hormone, *Canad. M. Ass. J.*, 1938, 39: 83.
   (*c*) *Idem*: The specific metabolic principle of the pituitary and its relation to the melanophore hormone, *Endocrinol.*, in press.
2. COLLIP, J. B.: Results of recent studies on anterior pituitary hormones, *Edin. M. J.*, 1938, 45: 782.
3. FINLEY, F. G. AND RABINOWITCH, I. M.: Renal glycosuria, *Quart. J. Med.*, 1924, 17: 260.
4. RABINOWITCH, I. M.: Simultaneous respiratory exchange and blood sugar time curves obtained in diabetic and non-diabetic individuals following ingestion of glucose, *J. Clin. Investigation*, 1925, 2: 143.
5. RABINOWITCH, I. M. AND BAZIN, A. T.: Blood sugar and respiratory metabolism time curves of normal individuals following simultaneously administered glucose and insulin, *J. Biol. Chem.*, 1928, 80: 723.
6. RABINOWITCH, I. M.: Respiratory metabolism studies in hyper-insulinism following ingestion of glucose, *J. Nutrit.*, 1935, 9: 205.
7. BENEDICT, F. G. AND CARPENTER, T. M.: Carnegie Inst. Wash., Pub. No. 261, 1918.

STREPTOCOCCI THROAT INFECTIONS: EPIDEMIOLOGY*

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IN discussing the epidemiology of streptococcic throat infections, such conditions as scarlet fever, epidemic sore throat and tonsillitis must be considered.

These three conditions are world-wide in their distribution, being much more common in temperate and cold than in hot climates. The seasonal incidence however is similar, each being most prevalent in the winter and early spring and dropping to a low during the summer months. While tonsillitis and scarlet fever are chiefly diseases of childhood, epidemic sore throat is more common among adults. The attack rates are higher for females than males in each of these three conditions.

Whereas tonsillitis is believed to occur chiefly as a sporadic disease, being transmitted from person to person through contact with a case or carrier, scarlet fever and epidemic sore throat occur both sporadically and in epidemic form. Epidemics of scarlet fever may be either due to contact infection or a contaminated food supply, chiefly milk. Epidemics of epidemic sore throat, on the other hand, are due chiefly to an infected milk supply resulting from infection of the cows' teats by a human case, a carrier. The belief of some that epidemic sore throat is only occasionally transmitted by personal contact is not borne out when secondary attack rates of an epidemic of streptococcic sore throat, due to an infected milk supply at Baldwinsville, N.Y., are studied. In this epidemic, of persons living in households where cases occurred but who themselves did not drink any of the infected milk supply, 20 per cent developed septic sore throat. In contrast, a secondary attack rate of 10 per cent is usually observed in scarlet fever epidemics.

Scarlet fever a century ago was a very mild disease; fifty years ago it was extremely malignant, and at the present time is a mild infection with a death rate of approximately 2 per 100,000 population. Although now mild in character there is no evidence to show that the incidence of scarlet fever has diminished.

In comparing mortality rates from scarlet fever in six northern States (Connecticut, New Hampshire, Maine, Michigan, Minnesota and Wisconsin) with five southern States (Kentucky, Maryland, North Carolina, Tennessee and Virginia) over the past twenty years, Ramsey has noted a more marked decline in mortality in the northern States than in the southern and that in each year since 1931, scarlet fever death rates in the southern States have been higher than for the northern. He also noted that the scarlet fever death rate in urban areas has declined to a greater extent than in rural areas.

Some most interesting epidemiological observations have recently been reported by Stebbins *et al.*, who studied seven milk-borne epidemics of streptococcal throat infections occurring in New York State during the years 1934, 1935 and 1936. Three of these epidemics were classed as scarlet fever and four as epidemic sore throat. All were characterized by an age-distribution typical of milk-borne outbreaks.

In the three epidemics of scarlet fever of particular interest was the observance of a typical scarlet fever rash in only 60 per cent of cases. A significantly higher incidence of the rash was noted in children than in adults. Eighty per cent of scarlet fever patients under fifteen years of age developed a rash as compared with 50 per cent of those fifteen years of age and over. Desquamation was noted in almost all cases with a rash. Patients who developed a rash were clinically indistinguishable from sporadic cases of scarlet fever or cases of scarlet fever observed in contact epidemics. Cases with no rash were indistinguishable from cases of epidemic sore throat under study at the same time. In addition cases of scarlet fever without a rash and cases of epidemic sore throat in the absence of an epidemic were indistinguishable from the type of case usually diagnosed as a severe tonsillitis.

Further observations revealed that 37 per cent of persons giving a history of a previous attack

* A contribution to the Symposium on Streptococcic Sore Throat held at Halifax, N.S., Sixty-ninth Annual Meeting of the Canadian Medical Association, on June 24, 1938.

of scarlet fever and who drank the infected milk developed the disease. These individuals were just as ill as those who denied having suffered a previous attack of scarlet fever. Case fatality rates and the incidence of complications were the same for both groups. The only difference noted was the proportion of cases in which a rash was observed. Less than 30 per cent of persons previously attacked developed a rash while nearly 65 per cent of those with no history of previous scarlet fever developed a rash.

Hobson reports an epidemic of sore throat among 371 boys in an English boarding school. During this epidemic 179 cases of illness were reported over a period of approximately two months. Twenty-seven per cent of the cases were diagnosed as scarlet fever, these presenting the clinical features of scarlet fever and being accompanied with a rash; 30 per cent had sore throat and temperature but no rash; and 43 per cent ran a temperature only.

Ramsey reports the results of detailed investigations of two scarlet fever epidemics occurring in Watertown and Binghamton, N.Y., in 1934 and 1935 respectively. During these investigations 1,585 scarlet fever contacts were observed for 90 days following the onset of the primary case in the household. In this group there occurred in addition to 177 diagnosed secondary cases of scarlet fever, 60 cases of suspicious illness, there being a suspicious case for every 3 clinical cases. Further investigation revealed that in 14 per cent of households the first positively diagnosed case of scarlet fever was preceded by a suspicious illness.

A consideration of the main facts brought out by these investigators clearly demonstrates the futility of the preventive measures which are being applied to the control of these diseases. It shows further that the name "Scarlet Fever" on the list of notifiable diseases is inadequate and misleading, tending as it does to isolate only the cases showing a rash and allowing the equally infective cases without a rash to move at liberty and spread a disease as serious in its course and complications as the other. It would seem advisable, if not imperative, that "Scarlet Fever" be replaced by the more comprehensive term "Streptococcic infections of the throat".

It is obvious that much is uncertain concerning the precise bacteriology and epidemiology of this prevalent infection, and some definite effort should be made to institute a searching investigation of the many obscure angles confusing epidemiologist, bacteriologist and clinician alike, and to bring, if possible, some measure of clarity to a difficult and dangerous problem.

THE CLINICAL ASPECTS, COMPLICATIONS AND TREATMENT OF STREPTOCOCCIC SORE THROAT*

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THE varied types of clinical conditions that are produced by the streptococcus are determined by the different types and strains of this organism. The different strains of streptococci produce different groups of symptoms. For example, one strain produces a definite scarlet punctiform rash, along with other symptoms, and later a desquamation of the skin. These cases are called "scarlet fever". Other strains produce all the similar local and general symptoms without the rash. These we call "tonsillitis" or "septic sore throat". So that from the clinical standpoint we can consider these types together.

There are numerous classifications of this type of infection. We have one in which the condition is divided into (1) simple sore throat; (2) septic or anginous sore throat; and (3) toxic or malignant sore throat. Watson-Williams makes a division into five classes: (1) simple septic inflammation; (2) membranous septic inflammation; (3) œdematous inflammation; (4) phlegmonous inflammation; and (5) gangrenous inflammation.

It would seem better to describe the onset and progress of a case from the beginning to the final stage. The class to which it belongs is determined by the stage at which the body is

* Part of a Symposium on Streptococcic Sore Throat, held at the Sixty-ninth Annual Meeting of the Canadian Medical Association, Halifax, N.S., on June 24, 1938.

enabled to establish sufficient immunity to arrest the progress of the disease.

The organisms gain entrance to the body through the nose or mouth. In the early stage a moderate amount of redness occurs of the entire mucous membrane of the nose and throat, with swelling of the lymphoid tissue (the tonsils, adenoid and lymphoid tissue at the base of the tongue). This results because of the special function of this tissue to react against infection. In this stage there is an exudate, more or less fibrinous in character, on the lymphoid tissue, and some rise in temperature. As the case progresses to a more severe stage the lymphoid tissue and the adjacent mucous membrane become more swollen and œdematous, with difficulty in swallowing, more exudate appears on the surface of the lymphoid tissue, a greater rise in temperature occurs, and more severe toxic symptoms are in evidence. The rapidity with which the disease advances from the mild to the severe stage depends on the dosage and virulence of the organism, the amount of lymphoid tissue, and the general resistance of the patient. If the patient is able to develop an immunity while the process is still confined to the lymphoid tissue, resolution commences, and the disease is of short duration and of a mild type. If the process is not limited to the lymphoid tissue, the case advances to one of the more severe types. The tonsil is the largest mass of lymphoid tissue, and therefore is the tissue that receives the brunt of the attack, and must react to produce a barrier to the spread of the infection.

The tonsil rests on the superior constrictor muscle, separated from it by a layer of connective tissue which forms its capsule. If the infection is not limited to the tonsillar tissue it extends through this capsule and comes into the space between the capsule and the muscle. Here it may become localized and form an abscess, which is called a peri-tonsillar abscess. The presence of a peri-tonsillar abscess is indicated by a bulging of the tonsil to the mid-line, a swelling above and behind it, and some difficulty in opening the mouth. If an abscess is formed in this position the infection is likely to be limited here and the abscess can be opened and drained, with very good prospects of rapid recovery.

If the infection spreads deeper than the constrictor muscle it will produce one of the more severe types of the infection. It can spread deeper in one of two ways: by the lymphatics and by the veins. If it spreads by the lymphatics it extends into the lymphatic glands of the neck and may yet become localized by forming an abscess of the gland, which in this case can be opened and drained. If the infection spreads beyond the constrictor muscle by way of the veins it goes into the deep spaces of the neck, and may produce there a thrombo-phlebitis, with great swelling, considerable difficulty in opening the jaw, difficulty in swallowing, and a septic temperature. This is called Ludwig's angina. If this thrombo-phlebitis continues to extend a general septicæmia may occur.

Thus we have described the extension of the infection as a gradual process. But, we sometimes get a case in which the progress is so rapid that the early stage of the disease is not seen at all. Before we see the case it has developed a fulminating toxic type and the patient is overwhelmed by the toxæmia and may die of cardiac failure in twenty-four to forty-eight hours, or he may develop a severe œdema of the larynx which if not relieved may produce death by asphyxiation.

In the differential diagnosis there are several conditions which must be considered.

1. *Diphtheria.*—In the City of Hamilton we have very little occasion to differentiate diphtheria, as our Health Department has so thoroughly toxoided our children that we rarely see a case. But, of course, the differentiation is the finding of the Klebs-Loeffler bacillus on culture.

2. *Vincent's angina* has a membrane that is usually easily detached. The general symptoms are mild, and the progress is usually of rather an indolent type. Here, again, the diagnosis can be made by the finding of Vincent's spirochætes and the fusiform bacillus.

3. *Syphilis.*—The lesion that occurs is a more definite ulceration with a punched-out margin. It, of course, does not produce the acute symptoms, and one has time to make laboratory tests.

4. *Agranulocytosis* and *infectious mononucleosis* are conditions which seem to be more common of late. In these we get ulcerative membranous lesions in the nose and throat. Diagnosis is made by the blood picture.

Complications.—The complications that occur are caused by extension of the infection to other parts of the body. This may occur through the Eustachian tube, to produce a middle-ear infec-

tion, with possible mastoiditis and the complications that occur from mastoiditis, *e.g.*, lateral sinus thrombosis and meningitis. Also, the infection may be carried from the nose into the nasal accessory sinuses. This sinusitis is likely to be of a severe type and difficult to clear up. The infection may also be carried by the blood stream or the lymphatics to distant parts of the body, producing joint conditions, heart or kidney involvement.

TREATMENT

The object of all treatment in infections is to assist the natural processes of the body in establishing an immunity, producing antibodies for the toxins produced by the bacteria. When once the organism gains access to the body and produces a reaction it cannot be destroyed or eliminated by any means except by the natural process of the production of immunity, so all our efforts should be to favour this process. Brenneman, in his "System of Pædiatrics", says "The therapy of the future will be on a more simple and rational basis, in which etiology and a specific remedy will play a larger part on the one hand, and more recognition will be given to the normal mechanism of defense and repair on the other."

The treatment of a mild case, if we are sure it is a mild case, is very simple, as it is only necessary that the patient be given a chance to develop his immunity. But, we never know in the beginning whether the case is going to be of a severe type or not, so that even a mild case must be treated as a potentially severe one.

The first point in treatment is *rest in bed.* From my earliest teaching in medicine I can recall that in all the diseases described to us the first point in the description of treatment was *rest.* The more one sees of infections, the more one realizes that this is always right. When the body is at rest metabolism is at a minimum, and thus the processes necessary in combating disease are under the most favourable condition.

The value of fever.—Brenneman, in his "Practice of Pædiatrics", Best and Taylor, in their "Physiological Basis of Medical Practice", and Price, in his "Practice of Medicine", refer to the value of fever in combating disease. Best and Taylor say "Fever is frequently the herald of serious disease; nevertheless, unless of high degree and on this account endangering the functions of vital tissues it should not be looked upon as a reaction detrimental in itself. On the contrary, there is every indication that its occurrence is an important aid to the body in its combat with the disease. The rôle which fever plays in the defensive process is, however, unknown. It has been suggested that the formation of antibodies can be elaborated only at higher temperatures. It is well known, for instance, that in infections which overwhelm the individual the temperature reaction is depressed." It has been shown that animals infected artificially run a milder course if the temperature is kept artificially raised.

Thus, if we believe that the fever is a reaction beneficial in itself, and an important part of combating the disease, it should be part of our treatment to favour the reaction. Antipyretics should be avoided. The drugs that we have to increase temperature are not well known or reliable, so that our efforts must be to retain heat, and prevent heat elimination. The old-time treatment of pneumonia in a very warm room, with plenty of bed clothes and hot poultices, would seem to have much in its favour. Keep the room warm and the humidity high. Warm dry air increases the evaporation from the skin and mucous membranes, and this increases heat elimination. Dr. Jackson emphasizes this in his description of acute tracheo-bronchial disease in children. He says the air should be saturated to the dew-point.

Increase fluids.—One of the effects of acute infection is an increase in the destructive phase of metabolism. The destruction of protein is abnormally great. There is an increased respiration and an increase in the circulation, and this, along with the higher temperature, produces a great loss in fluids. This must be replaced by increasing the fluid intake. Push fluids as much as possible, in the form of water and citrus-fruit drinks. Sugar can be added, as sugar, and the vegetable acids are said to be protein-savers. The fluids should also be as hot as can comfortably be taken, as this is one method of adding and retaining heat.

Antitoxin.—Dr. Fraser, of the Connaught Laboratories in Toronto, has reviewed the literature and experiences of the past few years in a paper in the *Public Health Journal,* and says that early use of scarlet fever antitoxin reduces the incidence of complications in scarlet fever, and suggests that the same antitoxin may advantageously be used in non-scarlet fever cases caused by a hæmolytic streptococcus. Our ex-

perience in the Hamilton General Hospital is that definitely fewer complications occur in the cases of scarlet fever that are given antitoxin, and the routine is that every patient with a temperature of 102° F. is given 6,000 to 12,000 units.

Sulphanilamide.—Much has been written of late in regard to this drug, and like all new drugs benefit has been claimed for its use in nearly all infections. Undoubtedly in streptococcus infections it is the most valuable addition to our pharmacopœia that we have had. Laboratory investigations have demonstrated that a certain definite percentage of concentration in the blood is necessary to produce an inhibition of the growth of bacteria. My routine is that in all cases in which I suspect a streptococcus infection I prescribe sulphanilamide by mouth. In children up to about fifty pounds in weight I give 20 to 30 grains in twenty-four hours, and in larger children and adults I give up to 60 to 100 grains in twenty-four hours for two days. My experience is that if I do not get improvement in the symptoms in forty-eight hours I do not get any help from this drug. If improvement occurs the drug can be carried on in decreasing doses. I urge the patient to increase fluids as much as possible, and sodium bicarbonate can be combined with the sulphanilamide. Saline laxatives with any sulphate radical should be avoided as they may produce hæmoglobinuria. Carbonated drinks should also be avoided. Some dramatic cures have been produced, and although it is very difficult to evaluate the effect in each case this drug is very valuable in streptococcic infections.

Local treatment. — Topical applications to acutely inflamed throats are of no value, and are very liable to do harm by abrading the surface of the mucous membrane, and thus opening a pathway to deeper infection. So-called throat irrigations are of value if the solution is as hot as the patient can comfortably stand (103 to 112° F.). These should really be called mouth irrigations, as it is impossible to carry a stream of solution into the throat for any length of time without drowning the patient. When one tries to irrigate the throat the base of the tongue comes up against the palate and closes off the throat. The heat that is supplied in this way however, is comforting, and is of value. Mild alkaline gargles, also hot, are of value in helping to remove some of the mucus that is often very uncomfortable. Cold and ice packs should be avoided.

Surgical treatment is indicated if there is a definite pocket of pus, or if there is an infection of the deep tissues of the neck, with or without infection in the veins of the neck. If a peritonsillar abscess is found this should be opened and drained as soon as possible. If a gland develops an abscess it should be opened, and if there is indication that the deep vessels of the neck have become thrombosed, these should be cut down on, and if necessary ligated. Of course, also, acute œdema of the larynx demands tracheotomy.

SUMMARY

The type and severity of the infection depends on the type and virulence of the organism. Treatment must aid the normal processes of defence against infection, and utilize specific remedies. Surgical treatment is indicated if there is a definite abscess or obstruction to breathing, or if there is involvement of the deep veins of the neck.

INSULIN AS A SUICIDAL AGENT.—However secure their position in relieving the burden of suffering humanity, few medicinal agents are exempt from being misused by criminals or by writers of fiction when murder or suicide demands efficient weapons. This is true of insulin. In Dr. W. Stanley Sykes's story, *The Missing Moneylender* (1931) a doctor kills his victim with an overdose of insulin, after his death injecting enough sugar intravenously to restore the blood sugar to its normal figure and thus to abolish the only possible clue. The first case in the literature of attempted suicide by insulin was reported in 1934 by J. T. Beardwood, Jr. (*Journal of the American Medical Association*, **102:** 765). The patient was a diabetic, and the dose employed was 390 units. Two other cases are briefly mentioned in this paper, one of which was a Philadelphia physician. A fourth case is now described by D. Donald and L. J. Foster in the December number of the *Journal of the Michigan State Medical Society* (**36:** 967). The story, however, both in its clinical and biochemical aspects, is complicated by acute alcoholism. A man aged 26 (non-diabetic) had heard from a doctor that it was presumably possible to kill a person with insulin without leaving a trace of the cause of death. While in a state of intoxication he took an overdose of 200 units. Admitted to hospital in coma, he remained unconscious for nearly three days, but finally recovered. The persistence of coma for forty-eight hours after the blood sugar had returned to normal was probably due to alcohol. He had made a previous attempt at suicide by slashing his wrist with a razor blade.—From *Brit. M. J.*

THE BACTERIOLOGICAL ASPECT OF STREPTOCOCCIC SORE THROAT*

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IN the discussion of the bacteriological aspect of streptococcic sore throat one is necessarily almost completely limited to the discussion of a single group of micro-organisms, the streptococcus. Sore throat in general may be the result of invasion by other pathogenic organisms, yet the great majority of cases of the disease are undoubtedly due to the pathogenic effects of the streptococcus, either as a primary or secondary invader, and therefore a review of the development of our knowledge concerning these common parasitic micro-organisms will not be without value in connection with this common, troublesome, and serious disease. The study of the etiological organism involved in any human disease has for its object the development of (*a*) an accurate diagnostic method, either by the identification of the organism, or of the antibody which its presence begets in the blood; (*b*) prophylactic measures by means of the production of active or passive immunity; and (*c*) a method of treatment by the use of immune sera. This sequence of developments has been accomplished in the study of *B. diphtheriæ, B. dysenteriæ, pneumococcus,* and various other pathogenic bacteria; and the intensive serological study of the streptococcus group, covering the last fifteen years, is beginning to give promise of the production of similar results. It is therefore necessary to confine the discussion of this subject mainly to the characteristics, classification, and present knowledge of the group of organisms included under the name streptococcus, of which *S. pyogenes* is the type strain.

The history of the development of our knowledge of this organism is full of interest. It was first described by Ogston (1881); its association with erysipelas was demonstrated by Fehleisen (1883); and its association with pus was shown by Rosenbach (1884), who gave it the name *S. pyogenes.* Marmorek (1895) noticed its hæmolytic properties and prepared an antiserum which was in common use for many years. The progress made in bacteriological technique enabled Gordon (1903) to classify it into six groups by the use of carbohydrate fermentation tests. This work was furthered by Andrews and Horder[1] who further defined the six groups, *viz., S. pyogenes, S. mitis, S. anginosus, S. salivarius, S. fæcalis,* and *S. equinus.* Schottmüller (1903) used the hæmolysis of blood cells as a differentiating factor, and classified it into *S. hæmolyticus,* and *S. viridans,* names which are still in use. Holman,[2] using a combination of hæmolytic properties and carbohydrate fermentation as a basis, classified the group into sixteen types, including both the hæmolytic and non-hæmolytic strains, and his classification was widely accepted. In 1919 Smith and Brown returned to hæmolysis as a basis of classification, and grouped streptococci according to the effect on a blood agar plate as follows: (*a*) Those showing alpha hæmolysis, or a ring of green around the colony, with an outer ring of partial hæmolysis, which group includes *S. viridans,* and *S. pneumoniæ.* (*b*) Those showing beta hæmolysis, or a ring of complete hæmolysis adjacent to the colony, which group includes *S. pyogenes* and/or *S. hæmolyticus.* (*c*) Those showing gamma hæmolysis, or no hæmolysis at all, which group includes the so-called "indifferent" streptococci. The classification of Smith and Brown is still in general use.

Then began the attempts to classify streptococci according to serological tests, using agglutinating sera. Agglutination tests with streptococci give considerable difficulty on account of the chain formation of the organism in culture, and the tendency of certain strains, *e.g., S. conglomeratus,* to clump spontaneously. In 1924 Dick and Dick, using serological methods, established two strains of the organism as the cause of scarlet fever, and out of their work grew the Dick test for the estimation of immunity to scarlet fever, and also a streptococcus antiserum which has been used in the prophylaxis and treatment of the disease. The difficulties attendant upon agglutination reac-

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tions as a basis of isolating strains turned the attention of Lancefield in 1928 to the study of this group by means of precipitin reactions, using extracts of the strains. She was (1933) able to group the organisms showing beta hæmolysis into nine groups, A, B, C, D, E, F, G, H, and K, with sub-groups. Group A includes *S. pyogenes;* Group B includes *S. agalactiæ,* the organism responsible for bovine mastitis; and Group D includes *S. fecalis lactis,* common in intestinal infections.

It will thus be seen that most of the work done in this century has been in connection with the classification of the group, and that at the moment there is every possibility that the serological grouping or typing of the streptococcus may progress, until its typing and serum therapy may soon be placed on the same basis as that of the pneumococcus which, by some workers, is classed as a streptococcus showing alpha hæmolysis. It will also be seen that the following terms apply to the principal pathogenic member of the group, *viz., S. longus,* or *S. pyogenes,* or *S. hæmolyticus,* or Lancefield's Group A streptococcus.

In the consideration of the bacteriology of streptococcic sore throat, the streptococcus pyogenes showing beta hæmolysis is by far the most important. The pathogenicity of members of this group is usually marked. *S. pyogenes* (hæmolyticus) is known to produce five types of toxin. The outstanding one is a filterable hæmolysin, the effects of which are easily demonstrable *in vitro,* while its effect on the blood of the patient suffering from its invasion is easily demonstrated clinically or by hæmoglobin estimations. Many strains have been shown to produce a leucocidin which has a lytic effect on the leucocytes. An erythrogenic toxin is produced, and this is demonstrated by the rash of scarlet fever and by the reddened area in the positive Dick test. A fibrolysin is also produced which digests fibrin already formed. Finally, a toxin which has been called a "spreading factor" has been demonstrated, which seems to prepare the adjacent tissue for the easy spreading of the other toxins. An organism so well equipped with offensive weapons may well play the variegated rôle in the production of human disease which it has been known to play since its discovery and study in the last century. The virulence of the hæmolytic strains showing beta hæmolysis considerably exceeds that of strains showing alpha hæmolysis, though the latter are responsible for many serious human diseases. The infectivity of strains of hæmolytic streptococcus was demonstrated by Dick and Dick in their experimental work on the etiology of scarlet fever, and by others.

Primary streptococcic sore throat most commonly takes the form of tonsillitis and nasopharyngitis. Bacteriological examination of cultures from the throats of normal persons commonly shows the presence of streptococci showing alpha and gamma hæmolysis, and occasionally of *S. hæmolyticus.* The incidence of *S. hæmolyticus,* according to Cameron and Dutton,[3] is greater during the winter months, and the organism is particularly prone to reside in the tonsillar crypts. This makes it probable that a portion of the cases may be due to *S. hæmolyticus* resident in the normal throat, but invading and becoming pathogenic when there is a sudden lowering of resistance, due to chilling, undue fatigue, or other cause. But undoubtedly the vast majority of cases are acquired by transmission from some infected individual, and this is amply borne out by the rapidity with which the illness spreads through a family or other associated group, when one becomes infected. Cultures from these cases nearly always show the presence of *S. pyogenes* (*hæmolyticus*). The same organism spreading to the accessory sinuses, the trachea or to the middle ear, sets up the characteristic infections there, and can be isolated from the exudates.

The other form of primary streptococcic sore throat is known as septic sore throat, and this is now known to be an epidemic disease, caused by the ingestion of milk infected by a hæmolytic streptococcus which has been called *S. epidemicus* by Davis. Streptococcus epidemicus shows beta hæmolysis, mucoid colonies, and capsules. In all other respects it resembles *S. pyogenes.* Subsequent work suggests that it may not be specific, since variation in strains of the organism is common, and since capsule formation has been noted in *S. pyogenes* when grown in milk. At any rate, all epidemics of septic sore throat studied bacteriologically show the presence of this hæmolytic streptococcus as the infecting organisms in the throats of patients, in the milk used, and very often in the udders of one or more cows supplying the milk. *S. agalactiæ,* the streptococcus causing mastitis in cows, is not pathogenic for man, and experimental work suggests that the udder of the cow is probably infected by the milker, who himself is carrying

a strain of *S. pyogenes* (*hæmolyticus*) on his hands or in his throat at the time. Epidemics of this disease have been occurring in Britain periodically over the past 50 years, and in North America during the present century. In 1930 a serious epidemic involving over 500 cases occurred at Kirkland Lake, Ontario, which was shown to be due to infected milk, and streptococci showing beta hæmolysis corresponding in type to *S. epidemicus* were isolated from the cases, from the milk, the milk handlers, and from some of the cows supplying the milk. It is to be noted that the milk was raw milk, and that efficient pasteurization is likely to prevent the occurrence of epidemics of this type of sore throat.

What may be termed secondary streptococcic sore throat occurs in connection with certain other diseases. The sore throat of scarlet fever is a constant associate of the disease, which is now definitely recognized as a general infection due to certain strains of *S. hæmolyticus*. Bacteriological studies reveal in this type of sore throat the constant presence of the strains of *S. hæmolyticus* which have been serologically identified as those capable of producing scarlet fever. It is perhaps open to question whether the sore throat in this disease is secondary or primary, but it is unquestionably a type of sore throat due to *S. hæmolyticus*, and is, in any case, one of the manifestions of the disease and not purely a local infection.

Vincent's angina is characterized by a sore throat, and etiologically is due to invasion by *Spirochæta vincenti* associated with *B. fusiformis*, which is held by some workers, but not by all, to be a mutation form of the spirochæte. But the more severe types of sore throat associated with this infection very commonly show *S. hæmolyticus* on culture, and undoubtedly the secondary invasion of the throat by this organism, whether as a normal resident which seizes the opportunity to display its pathogenicity or an intruder introduced from without, is the cause of the much increased severity of the symptoms in certain cases.

The disease known as infectious mononucleosis also exhibits sore throat as one of its relatively constant features, and in the more severe types of angina associated with it it is not uncommon to isolate organisms of the streptococcus group showing beta hæmolysis.

To summarize briefly, streptococcic sore throat is a disease entity produced by invasion of the pharyngeal tissues by strains of the streptococcus group. The pathogenicity of members of this group has been known for fifty years, and their classification has been a problem for the past thirty years. They were first classified by length of chains, then by the production of hæmolysis, and later by the study of their carbohydrate fermentation reactions. In 1916 a classification based on hæmolytic properties and carbohydrate fermentation was introduced and widely used. In 1919 a classification based on types of hæmolysis was introduced. The present classification is based on hæmolysis, combined with serological reactions, using precipitin rather than agglutination reactions. The hæmolytic group of streptococci is the most pathogenic and is responsible for the primary types of streptococcic sore throat as well as some secondary types. There is every reason to hope that in the very near future the classification of the streptococcus group will be comparable to that of its closely allied group, the pneumococcus, and that the resultant production of immune sera for treatment will greatly aid the physician in his handling of this common and occasionally serious human ailment.

REFERENCES

1. ANDREWS, F. AND HORDER, T.: *The Lancet*, 1906, 2: 708.
2. HOLMAN, W. L.: *J. Med. Res.*, 1916, 34: 377.
3. CAMERON, G. C. AND DUTTON, E. M.: *Canad. Pub. Health J.*, 1932, 23: 9.
4. FRASER, F. H. AND PLUMMER, H.: *Trans. Roy. Soc. Can.*, 1931, 25: Sec. V, 101.
5. MCKAY, A. L.: *Canad. Pub. Health J.*, 1932, 23: 9.
6. MCNABB, A. L., FRASER, F. H. AND FRASER, D. T.: *Canad. Pub. Health J.*, 1931, 22: 236.
7. PLUMMER, H.: *J. Bact.*, 1935, 30: 5.
8. TOPLEY, W. W. C. AND WILSON, G. S.: Principles of Bacteriology and Immunity, Wood, Baltimore, 2nd ed., 1936.

MEULENGRACHT TREATMENT OF BLEEDING PEPTIC ULCER.—The treatment is essentially a program of liberal feeding immediately upon the hospitalization of a patient for hæmatemesis and melæna from ulcer. The diet is supplemented by the administration of iron compounds (ferrosi lactatis) and a mixture (sod. bicarb., mag., subcarb., extr. hyoscyam.) designed to exert an antacid and antispasmodic effect. Thirty cases treated in this way were compared with thirty cases treated by the Lenhartz method. In one patient hæmorrhage recurred three months after discharge, but recovery was prompt under the new treatment. No deaths were recorded, as compared with six deaths among the Lenhartz group. Of those surviving, one had a recurrence of the hæmorrhage and another developed perforation and required immediate surgical intervention. In Meulengracht's own report the mortality rate from hæmorrhage was reduced from 8.1 per cent to 1.3 per cent in a series of 368 consecutive cases.—Boyd, L. J. and Schlachman, M.: *Med. Clin. N. Am.*, 1938, **22**: 1397. Abs. in *Brit. M. J.*

HUMAN STERILITY*

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IN the Midrash Debarim Rabbah a dictum of the Rabbi Johathan is introduced which runs, "There are three keys in the hand of God, which none of his creatures can dispose of, neither an angel, nor a seraph. These are the key of mortality, the key of the sterile, and the key for the rain."[1] The Mohammedans show their submission to the will of Allah on the question of sterility as found in the Koran. "God causes, according to His will, one woman to get girls, another boys, another children of both sexes; He also makes woman sterile." There is an old Japanese saying that women become sterile if they eat akinasubi. Akinasubi is a late fruit of solanum, and contains little or no seed core. This old saying may have some virtue in it, because the seed core would contain the germ of the seed and the bulk of the vitamin E factor. We believe that vitamin E may have some influence on fertility. The Israelites regarded sterility as a great misfortune when we read this quotation, "The poor, the leprous, the blind and the childless are to be looked upon as not alive". The treatment of sterility among the early races varied from the help of the supernatural to such simple remedies as a cold bath. In ancient Rome the sterile women directed their prayers to Juno Februalis, the purifier. In ancient Greece many springs and wells were said to hold a cure for sterility, for example, the Thespian Spring on the Helicon. Pliny tells of the special properties of the waters of Sinnessa for producing fertility.

Etiology

The underlying etiological factors in human sterility may be grouped into three fundamental principles according to S. R. Meaker. In most cases of human infertility the cause of that defect is not some single abnormality but rather the summation of several factors, there being 4.79 factors for each childless couple. These multiple factors are partly constitutional and partly genital. The several factors present in each case are seldom limited to one partner. Meaker likes the term "sterile mating" rather than "sterility" of man or woman.

General Factors Influencing Both Male and Female

Racial.—According to international statistics a birth rate of less than 30 per 1,000 inhabitants is considered low. A rate between 30 and 40 per 1,000 inhabitants is considered normal or average, and a rate of over 40 per 1,000 inhabitants is said to be high. This method of calculation is, however, open to criticism because of the variation in the number of old people and children. Even if the adult female population was alone considered, the figure would not necessarily be too dependable. Taking Europe as a unit, the average number of children per family was 4 some years ago, but this figure today is 2.9. The recent standstill in the population of France is not due to a decline in marriages, but to the fact that the marriages in France of recent years are less fruitful. The Jewish race in the meantime has maintained its traditionally high fertility. The Southern Slavs are still very fertile. Fertility among the Asiatics varies considerably. Asiatic families vary from 2 to 20 according to the particular people considered. The Eskimos have relatively small families. The average North American Indian family is smaller than the white. The native women of Australia are very fertile. We may therefore conclude that race has an influence on fertility.

Age and fertility.—Fertility attains its highest peak when the parents are nearly the same ages, or when the husband is from one to six years older than the wife. Fertility tends to diminish gradually after the age of 33 in men and after 26 in women. Premature marriages usually result in few and delicate children. Age, therefore, has a definite influence on fertility.

Climate and fertility.—Orientals living under the same climatic conditions show a great variation in fertility. This may in part be due to certain early marriages and to the modes of living. Climate does not seem to influence fertility as readily as race. Sudden climatic changes may however have a decided effect on

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fertility. European women are more susceptible to the influences of tropical climates than men. Women often show marked menstrual changes when they first arrive in the tropics. Abortion in these women is more common, so also is sterility. Extreme climatic changes therefore have a definite effect upon fertility.

The seasons and fertility.—The maximum number of births occur in the early spring and the minimum at the end of the year. Thus the maximum number of conceptions take place at the beginning of the summer, or in the late spring. Hence the seasons seem to have an influence on fertility.

Civilization and fertility.—Darwin said, "Any change in the habits of life, whatever these habits may be, if great enough tends to affect in an inexplicable manner the powers of reproduction". Among civilized human beings the sex life is frequently disordered. Ten per cent of matings fail to produce a conception; 20 per cent of gestations end in miscarriages. Pregnancy complications are common among the civilized peoples. Comparative figures for the primitive races are not available. Human energy is expended in two ways, for individuation and genesis. The more used for individuation, the less remains for genesis. It seems therefore, that the manifold strains of a complex and artificial mode of life have operated slowly over centuries to reduce the energies available for reproduction. However, voluntary limitation of families remains the chief cause in the modern decline of birth rate. The comparative infertility of the intellectual groups is explained by the late marriages of these couples, brought about chiefly by economic pressure. Some method of contraception is in common use today. Certain methods are harmful, but there is no reason to believe that evil results will follow approved methods of contraception.

Constitutional factors.—Reasonably good general health is essential for the production of normal eggs or spermatozoa. The sex cells are highly specialized cells, and are among the first cells in the body to suffer from constitutional disturbances. Constitutional upsets will affect individuals differently. There are five major groups of these constitutional disturbances: chronic intoxication; metabolic disturbances of extrinsic origin; general debility; constitutional inferiority; endocrine disturbances.

Chronic intoxication.—This includes foci of infection present over a long period of time. Toxins from malaria and syphilis act as causes. Prolonged use of alcohol or excessive use of tobacco may act as underlying factors. The prolonged use of such drugs as morphia or its derivatives will damage the sex cells.

Metabolic disturbances of extrinsic origin.—This refers to abnormalities of metabolism resulting from external factors such as faulty diet, lack of fresh air and exercise. Malnutrition resulting from a dearth of good food or to a poorly balanced diet. A diet deficient in proteins, mineral salts, or vitamins A and E will in time have a detrimental effect upon fertility. On the contrary, dietary excesses may lead to abnormal obesity and finally to the production of sluggish sex cells. Sedentary habits, dietary excesses, too much alcohol and tobacco, combine in time to inhibit greatly the production of normal sex cells.

General debility.—Acute or chronic illnesses frequently act as causes of sterility. Intensive living in the modern world may lead in time to unhealthy sex cells. This is exemplified by the modern business or professional man who carries heavy responsibilities with their accompanying worries and improper hours of rest. General ill-health results at a relatively early age.

Constitutional inferiority.—A certain few men and women consistently show an inferior grade of sex cells without any obvious cause.

Endocrine disturbances.—Nearly 60 per cent of cases of primary sterility show endocrine disturbances. The anterior lobe of the pituitary is most commonly at fault, and frequently the thyroid, or sex glands. Usually these three glands combine in their guilty behaviour.

CLINICAL CLASSIFICATION OF STERILITY

A. Functional sterility.

B. Primary sterility: (1) congenital; (2) acquired.

C. Secondary sterility.

Etiological factors of sterility.

A. Functional sterility: (1) impotence of husband; (2) non-occurrence of coitus; (3) vaginismus; (4) dyspareunia; (5) sex incompatibility.

B. Primary sterility: (1) congenital—malformations, *e.g.*, vagina—absence, atresia, or stenosis of; uterus—absence, atresia or stenosis of; Fallopian tubes—absence, atresia, or stenosis of; ovaries—absence or maldevelopment of. (2) Acquired—vagina—atresia or stenosis of; uterus—displacements, inflammations, tumours; Fallopian tubes—inflammations, tumours of; ovaries—inflammation, tumours, atrophy.

C. Secondary sterility: causes are similar to the acquired primary group above outlined.

INVESTIGATION OF A CASE OF STERILE MATING

A. Wife

(1) History. (2) General physical examination. (3) Pelvic examination.

History—The important features are: age; past illnesses; duration of marriage; previous marriages; previous pregnancies; menstrual history; endocrine changes; practice of birth control; intercourse habits; environment; living habits; exercise; rest hours; diet; alcohol and tobacco; drugs.

Physical examination.—Weight; height; fat distribution; hair; teeth; tonsils; temperature; pulse; respiration; blood pressure; urine analysis; hæmoglobin and blood count; heart; lungs; abdomen; basal metabolic rate.

Pelvic examination. — External genitals; vagina; cervix; uterus; adnexa.

Special features of the pelvic examination.—Check carefully for an imperforate hymen, septa and condition of Bartholin's glands. If there is a suspicious discharge take smears from the urethra and cervix. Test the reaction of the discharge in the vagina and cervix. The vaginal discharge is normally acid and the cervical is alkaline. A frothy discharge is checked for the Trichomonas. Note the position of the cervix, also the size of the external os. Note the position, size and contour of the uterus. A retroverted uterus may be the cause. Now check the adnexa for size and position.

If the history and examination of the wife are so far essentially negative one should next check the husband before subjecting the wife to further investigation.

B. Husband

(1) History. (2) General physical examination. (3) Genito-urinary examination.

History.—The important features are: age; previous marriages (fertile or not); past illnesses (mumps, venereal disease); practice of birth-control; endocrine changes; intercourse habits; environment; living habits (exercise, rest); diet; alcohol, tobacco and drugs.

Physical examination—Weight; height; fat distribution; hair; teeth; tonsils; temperature; pulse; blood pressure; urine analysis; blood examination; heart; lungs; abdomen; basal metabolic rate.

Genito-urinary examination.—Check the external genitalia for any gross defects, and if necessary have the husband checked by a competent urologist.

Examination of the spermatic fluid. — This may be done from a condom specimen or from a specimen collected from the cervix or vagina. The specimen should be examined one or two hours after intercourse.

The Hühner test.—Have the wife report to you about one hour after coitus. Collect a drop of the semen in a small pipette from the cervical canal, and place it directly on a warmed glass slide. Spread it thinly on the slide, and examine it under low power. This is a simple method and is fairly accurate. Normal spermatic fluid is alkaline. The total volume varies from 3 to 6 cubic centimetres. It is fairly clear or of a whitish colour. There should be 75 to 200 million spermatozoa per c.c. of fluid. They are quite uniform in size. Seventy per cent of the spermatozoa are normally very motile; 15 per cent may appear non-motile. Normal active spermatozoa remain active for twelve to twenty-four hours at room temperature. They will live for twenty-one days in a buffered glucose solution. Abnormal specimens lose their motility in eight hours or less.

If the investigation of the husband proves that he is essentially normal, one then returns to further investigate the wife. This final study of the wife includes a study of the endocervical secretions, insufflation of the tubes, and hysterosalpingography.

Study of the endocervical secretions.—Insert a clean bivalve speculum into the vagina to expose the cervix well. Wipe away the excess secretion from the vagina around the cervix, and wipe off the external os with clean cotton. Collect a sample of secretion from the cervical canal with a clean pipette. Check its reaction, which should be alkaline, and examine it under low power with a methylene blue stain. Normally this smear contains epithelial cells, a few leucocytes and mucus, but is free of bacteria.

Insufflation of the Fallopian tubes (Rubin test).—This test is best done at the end of the first week after a period is over. The technique is reasonably simple. An anæsthetic is not usually necessary. One may use the Rubin apparatus or some modification of it. Expose the cervix well with a speculum, and wipe away the excess secretion in the vagina. Insert the cannula into the cervical canal so that its tip passes well beyond the internal os, and the obturator fits well against the external os. Insufflate gradually and steadily until the pressure reaches about 150 mm., then slow up. Normally a fall begins here. If this fall does not occur, you then gradually increase the pressure up to 200 mm. if necessary. One should not go beyond 200 mm. pressure. Normally the pressure rises to a point between 120 and 150 mm. and then drops about 20 points. In partial obstruction the pressure rises to nearly 200 mm. and drops slowly to about 120 mm.

Contraindications and dangers of tubal insufflation.—If there is any possibility of pregnancy being present; a pressure over 200 mm. should not be used; insufflation should not be done during menstruation; it should not be done in the presence of an acute or subacute pelvic inflammation; it should not be done in the presence of any uterine bleeding; it should not be done immediately after a curettage.

Hysterosalpingography.—This will give more accurate information than tubal insufflation. It need not be done routinely, but is resorted to when particularly indicated for diagnostic purposes. It should preferably be done at the end of the first week after a menstrual period is over. An anæsthetic is not necessary. The patient need not necessarily be shaved. Wash the vulvar area clean with soap and water. Wipe away the excess secretion from the vagina, and then apply half-strength iodine to the vaginal walls and cervix. Warm the iodized oil before injecting. Collect 10 c.c. of the oil in the cannula and insert the cannula into the cervical canal snugly. Attach the syringe to the cannula and slowly inject the oil. It requires from 3 to 8 c.c. to fill the uterine cavity. Now increase the pressure slowly. If one tube only is open, 2 or 3 c.c. more will pass in; if both tubes are occluded not more than 3 to 8 c.c. in all will leave the cannula, even though the pressure is gradually raised to 300 mm. Now take an x-ray picture with the cannula still in the cervix. Remove the cannula, wipe the vagina free of oil, and apply a pad.

The endocrines and sterility. — The glands commonly associated with sterility are the pituitary, thyroid, and ovary. Pituitary failure.—This may be evidenced by defects ranging from gigantism to dwarfism. An abnormal distribution of hair is common. The body weight is above average. Thyroid failure.—The body weight may be either below or above normal. The myxœdemic type is fat, with heavy eyelids and stubby fingers. Ovarian failure.—Uncomplicated ovarian failure seldom causes systemic changes. There is often an abnormal fat distribution over the trunk and breasts.

Fatigability is present in 66 per cent of the thyroid and ovarian dysfunctions. *Nervous instability* is found in 50 per cent of those with pituitary changes, 75 per cent of those with thyroid changes, and 100 per cent of those with ovarian changes. *Obesity* is a fairly constant change in the failure or changes of the pituitary, thyroid, and ovary. *Menstrual changes.*—Pituitary cases tend to have an increasing interval, with scanty periods; thyroid cases vary considerably, but most of them become irregular; ovarian cases show a lengthening of the intermenstrual interval, and dysmenorrhœa is rather common.

TREATMENT

TREATMENT OF THE WIFE

A. General treatment.—Correct the predisposing causes such as general health, by making the necessary changes in the mode of living, such as rest, diet, working hours, fresh air and worry.

B. Local factors in treatment.—Dyspareunia.—Ascertain the cause and correct it. Vaginismus.—This is often difficult to treat. Begin by telling the patient she is normal and the results depend mostly upon her own efforts. An occasional patient may be relieved by giving her an anæsthetic and performing only a very minor operation such as a perineotomy. The psychic effect seems to be the main influence in these cases.

Intercourse *without* cervical insemination.—Try an alkaline douche for several days half way between periods. Insert a proper fitting Smith-Hodge pessary. This is tried even though the uterus is in quite normal position. The pessary forms a small depression in the posterior vaginal wall just in front of the cervix. This depression acts as a receptacle for the semen. J. Hirschmann[2] reports 17 out of 18 cases treated successfully in this way. Anteversion of the cervix is corrected by correcting the retroverted uterus. Endocervicitis is commonly treated with an electric cautery. Tubal obstruction may or may not be satisfactorily treated surgically. Hypoplasia of the ovary seldom yields satisfactorily to treatment. Damage to ovary by x-ray—an occasional case will return to normal in time. X-ray therapy in the pelvis of the younger woman is usually always contraindicated. Such therapy is better reserved for use in women at or near the menopause. Ovarian tumours should be removed surgically.

C. Endocrine therapy.—Gonadotropic hormone may be tried for the related pituitary and ovarian dysfunctions. This is the anterior-pituitary-like hormone extracted from the urine of pregnant women. It may be given intramuscularly, twice weekly. Ovulation in rabbits has been produced by giving œstrin (Wunder

and Paducheva[3]). Ovulation in women has been reported to have been produced by using the blood serum of pregnant women. This work was to have been reported by Davis and Koff, of the University of Chicago. At present, endocrine therapy does not offer us any great degree of help in the treatment of sterility.

TREATMENT OF THE HUSBAND

A. General treatment.—This means the correction of the predisposing causes such as working hours, lack of rest, fresh air, and exercise. Worry is a factor here, and should be brought under control. Constitutional diseases would be diagnosed and treated.

B. Local factors of treatment.—Hypoplasia of the testicle in the adult does not readily respond to any form of treatment. One may try testosterone propionate in the younger adult males. Undescended testicle in the adult usually results in seriously impaired function. Here testosterone propionate is more worthy of a trial. Testicular disease usually results in permanently impaired function. Obstruction and occlusion in the male genital tract often yield to suitable treatment. Chronic prostatitis and vesiculitis require prolonged treatment and may frequently end satisfactorily. Impotence requires patient treatment over a long period of time. Excellent results may be obtained when sexual excesses and bad habits of living are properly brought under control.

CONCLUSION

1. A general review of the main features involved has been attempted.

2. Sterile mating usually results from causes which are not necessarily limited to the male or to the female, but both parties may be partly at fault.

3. The general factors influencing fertility are race, age, climatic changes, civilization and constitution.

4. A clinical classification of sterility is outlined with special reference to the etiology.

5. A method of investigation is outlined.

6. Treatment for the male and female is outlined.

REFERENCES

1. PLOSS, H. H. AND BARTELS, M. AND P.: Woman, Heinemann, London, 1935, 2: 278.
2. HIRSCHMANN, J.: Note on the treatment of sterility, *The Practitioner*, 1937, 138: 111.
3. WUNDER AND PADUCHEVA: *Bull. de Biol. et de Médecine Exper.*, 1936, 2: 217.

EMPYEMA*

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ALTHOUGH empyema of the pleural cavity must be a very old disease the first reference to its treatment was made by Hippocrates. He advocated letting the pus out through an incision and instilling oil and wine, principles which do not vary much from what is practised today. The literature on the subject has been voluminous and at times markedly controversial. I do not propose to add any new fuel to the fire, but rather to review the results of what might be called modern treatment over a ten-year period at St. Michael's Hospital. The number of cases treated in the acute stage is 83, one of them being bilateral.

ETIOLOGY

Tuberculous empyema has been excluded in this study. Pneumonia accounts for 84 per cent, and other causes 16 per cent, as shown in Table I.

TABLE I.

Cause	*Number*
Secondary to pneumonia	70
Lung abscess or bronchiectasis	6
Subphrenic abscess	3
Liver abscess	1
Septicæmia	2
Spontaneous hæmopneumothorax	1

The organism found in the pleural cavity is not always the same as that found in the sputum, and, because the type of organism causing the pus determines the pleural reaction, which in turn has such a direct bearing on the prognosis and treatment, it is most important to know what organism is causing the empyema. In this series staphylococci occurred in 6; streptococci in 28, and pneumococci in 36.

* Read before the Fifty-eighth Annual Meeting of the Ontario Medical Association, Toronto, 1938.

PATHOLOGY

The causative organism also accounts for the variation in the time of the appearance of the empyema as well as its varying physical characteristics. Those empyemas occurring secondarily to a pneumonia may be divided into two types.

Metapneumonic empyemas appear after the pneumonia has subsided, and are usually due to the pneumococcus. The pus is thick and there is an abundant fibrinous exudate on the pleura. This aids the early formation of adhesions, and the fibrin under the pleura as well as on it helps to stiffen the mediastinal reflection. The pleural cavity may be loculated, and there are large masses of fibrin in the pus.

Synpneumonic empyemas, occurring as they do early in the course of the pneumonia, are usually due to streptococci. The pus is thin and frequently copious. There is little fibrin, and adhesions are slow in forming. Other organs are often involved.

When a lung abscess drains into the pleural cavity the resulting empyema is usually characterized by thin, brown, foul pus from which, can be grown various organisms but most frequently, in our experience, an anaerobic streptococcus. The escape of air from the abscess into the pleural cavity collapses the lung just as distressingly as a massive synpneumonic empyema, unless there are adhesions. An adjacent subphrenic abscess usually has organisms of the *B. coli* group which tend to produce a fibrinous exudate. The effusion above the diaphragm tends to assume the same character, and adhesions form early.

MORTALITY

There were 14 deaths, or a mortality of 16.7 per cent, for the ten-year period. In analyzing the cause of death it is found that 78.5 per cent had such serious other complications of the original disease as to cause or materially contribute to the cause of death. These complications were, septicæmia, bilateral pneumonia, pericarditis, endocarditis, peritonitis, liver abscess, meningitis, extradural abscess, etc.

In only one instance did the operative treatment seem to have any bearing on the cause of death. This man had had an intercostal stab drainage for a group IV pneumococcus empyema. The closed drainage did not work well, and he developed an abscess in the chest wall. He died two days after a rib resection, and as he had a pneumococcus empyema it would have been wiser to have done a rib resection in the first place.

The mortality varies from year to year, and it is most significant that it is highest in those years having more streptococci empyemas. Streptococci were the causative organisms in 57 per cent of the deaths; pneumococci in 21 per cent; and staphylococci in 14 per cent. On the other hand the mortality in streptococci empyemas was 28.5 per cent; in pneumococcal cases 8.3 per cent; and in staphylococcal cases 33.3 per cent.

TREATMENT

The general principles of treatment may be condensed into: (1) draining the pus; (2) correcting abnormal intrathoracic pressure; and (3) promoting re-expansion of the lung.

The methods we have used are: (1) closed drainage, including (*a*) repeated aspirations, (*b*) catheter drainage, (*c*) intercostal stab drainage, and (2) rib resection and open drainage. In general we have used closed drainage (*a*) in all synpneumonic empyemas regardless of whether they were due to the streptococcus or pneumococcus; (*b*) in the case of those very large exudates where there was considerable distress due to the amount of fluid; (*c*) in those cases secondary to sudden rupture of a lung abscess with a large distressing pyopneumothorax.

Repeated aspiration alone will occasionally result in a cure, as it did in two of our cases. One was due to a streptococcus and the other to a pneumococcus. Repeated aspirations were used on those patients thought to be too ill to stand any other treatment. It was the preliminary step in all streptococcal cases. In only 7 per cent was it the only form of treatment, and the mortality of this small group was naturally high, 66.6 per cent.

Catheter drainage has been strongly advocated in many centres, but has not been very satisfactory in our experience, and as a consequence was used in only 8 per cent of our cases. The catheter may be inserted without moving the patient out of his bed. Our mortality was 14 per cent. It is hard to keep the necessary irrigating apparatus working, and in our experience 50 per cent of our catheter drainage cases soon needed further drainage operations.

Intercostal stab drainage is the method in which a stiff rubber tube as large as the intercostal space is shoved through a stab wound which is made along the aspirating needle. It has been my habit to connect this to a tube over the side of the bed and inserted under water in the drainage bottle. A collapsible tube, such as a piece of a Penrose drain, fills in one segment of this drainage system and, acting as a one-way valve, lessens the chance of aspiration of air when the nurses change the drainage bottle. This method was used in 42.8 per cent of our cases and had a mortality of 13.8 per cent. However, 27.7 per cent of the people drained in this way subsequently required a rib resection. It was possible to keep the system closed on an average of 12 days. Chronic empyema resulted in 22.2 per cent of cases treated by this method.

This method is more efficient than catheter drainage, but should be carried out in the operating room. It is reasonably easy to do under local anæsthesia, but is not devoid of risk. On two occasions the knife has gone through the diaphragm. In both cases a rib was resected, the diaphragm sutured, and the empyema drained by open drainage. Both patients recovered without peritonitis. Closed drainage of all types was performed in 58.3 per cent of our cases, and as they included the most seriously ill patients the group mortality is higher, 20 per cent.

Open drainage.—The most efficient way to drain out thick pneumococcic pus and remove the large masses of fibrin is to remove a segment of rib in a dependent part of the cavity. This operation is comparatively simple and is best done under local anæsthesia. The pus is located with a needle, and a segment, 1½ to 2 inches, removed from the rib below. A good site is the 8th rib in the posterior axillary line. For the past three years the incidence of metapneumonic empyemas has been increasing, and as a consequence we have been doing more rib resections. In this series they number 41.6 per cent of the total operations. The mortality in this group was 8.5 per cent. The efficiency of this method of drainage is illustrated by the fact that only 8.5 per cent required any further operations. However chronic empyema resulted in 22.8 per cent, which is the same incidence as in the intercostal stab drainage cases.

Chronic empyema occurred in 22.6 per cent of all our cases. Included in this group are all cases with discharging sinuses three months after the acute process was drained. Our experience bears out Hedblom's conclusions that the causes of chronic empyema are (1) inadequate drainage; (2) late drainage; (3) persistence of infection; (4) bronchial fistula; (5) foreign bodies; (6) tuberculosis; (7) large stiff-walled cavities; (8) fibrosis of lung. By establishing adequate drainage and persisting in Dakin's irrigation we succeeded in having most of our chronic cases eventually heal. Those that did not, finally did after partial thoracoplasty. Bronchial fistulæ occurred in 10 per cent, but all healed except one which was closed with a pedicle muscle graft.

Foreign bodies as a cause of chronic empyema must be thought of, even if the patient is continually in the hospital. On two occasions I removed pieces of drainage tube, and no one knew how or when they were lost. On only one occasion have I found a piece of dead rib the cause of the discharge.

AFTER-CARE

The after care of an empyema resolves itself into good nursing and judicious oversight on the part of the attending surgeon. The simpler the apparatus, the less worry there is. Closed drainage tubes must not be kinked, and the end of the tube must be under water. The joints have to be well sealed. Open drainage tubes should be changed every seven to ten days and fastened so that the inner end is inside the empyema cavity. I like Dakin's solution irrigations on all open cases that have no bronchial fistula. Recently I have been using azochloramid, but have not had enough experience with it to come to any definite conclusion. The size of the cavity should be measured once a week by filling it with measured amounts of saline.

General tonic measures are most useful. Over 50 per cent of our cases received one or more transfusions. They are encouraged to move around in bed, and coughing is not suppressed unless it is very distressing. They are allowed out of bed when their temperatures are normal and they feel strong enough.

CONCLUSIONS

It would appear to be difficult to lower further the mortality of a series of empyema cases unless some method were discovered to lessen the involvement of other organs in the streptococcus

cases. It is too early to say whether in sulphanilamide we have an adequate therapeutic agent or not.

Repeated aspiration is the preferred preliminary method in the treatment of streptococcal cases.

Closed intercostal stab-drainage is an efficient method in the later stage of streptococcal cases or in others where the amount of pus is very great. The fact that some will require a rib resection later does not detract from its value.

A rib resection, with an opening large enough to remove the masses of fibrin, is the preferred method in most pneumococcal cases.

LIPIODO-BRONCHOGRAPHY*

BY J. GOSSELIN AND J. E. PERRON

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DURING the past few years several descriptions of different bronchographic methods have been given. After trying all these methods we would like to demonstrate the advantages of a method that we now use and that we have found to give the best results. We need not discuss here the principles underlying this question. The properties of lipiodol, the technique of its use, and the importance of bronchographic diagnosis are already well known.

At our hospital, a sanatorium of several hundred beds for tuberculosis, we have to make such examinations. With the fullest cooperation of our entire medical staff the cases are carefully selected, and we are assured of convincing results in every case. Much of the success we have obtained is due to the expert assistance given by our technicians who have been trained in the use of this method.

First of all, we shall mention briefly various bronchographic methods we have used and then describe our results with the new method. It is not really a "new" method, as it has been in use for the last three years. Such examinations are essential in our special type of hospital work, for they are the only methods of visualizing the cavities of the lungs.

Several years ago we used the first method, known as bronchography through the glottis: that is, after the soft palate and pharynx had been anæsthetized the lipiodol was introduced into the glottis by means of a curved tube attached to a syringe. This operation was full of difficulties because of the need of using a laryngeal mirror, the necessity of having a trained laryngologist, and dependance on the good behaviour of the patient. We must admit that this method gave some good results, but the difficulties of its technique often discouraged the roentgenologist.

Next, we tried transglottic or in intra-tracheal bronchography. In this method we used the same apparatus, with the exception that the injection tube was much longer than in the first method, thus permitting the introduction of lipiodol as far as the trachea. The results were more successful, but we encountered more difficulties than before.

A third method was tried, namely, the subglottic or trans-cutaneous method. In this, the injection of lipiodol was made by puncturing the crico-thyroid membrane by means of a curved needle attached to a syringe. In addition to the training of a laryngologist, considerable surgical experience was also required to get good results. We must admit that when we could succeed in doing this special injection we obtained perfect results. However, there was always the difficulty of having the patient agree to an examination which is more surgical in appearance than radiological. This method has been abandoned because too many anatomical lesions were possible in its technique, and in a few cases there were infection and œdema.

Later, we called in the laryngologist to introduce the lipiodol by means of the bronchoscope. One of the advantages of this method was that the secretions could be withdrawn by suction through the bronchoscope before the introduction of lipiodol. This method produced the best results, but entailed even more difficulties than had been encountered in the previously attempted methods.

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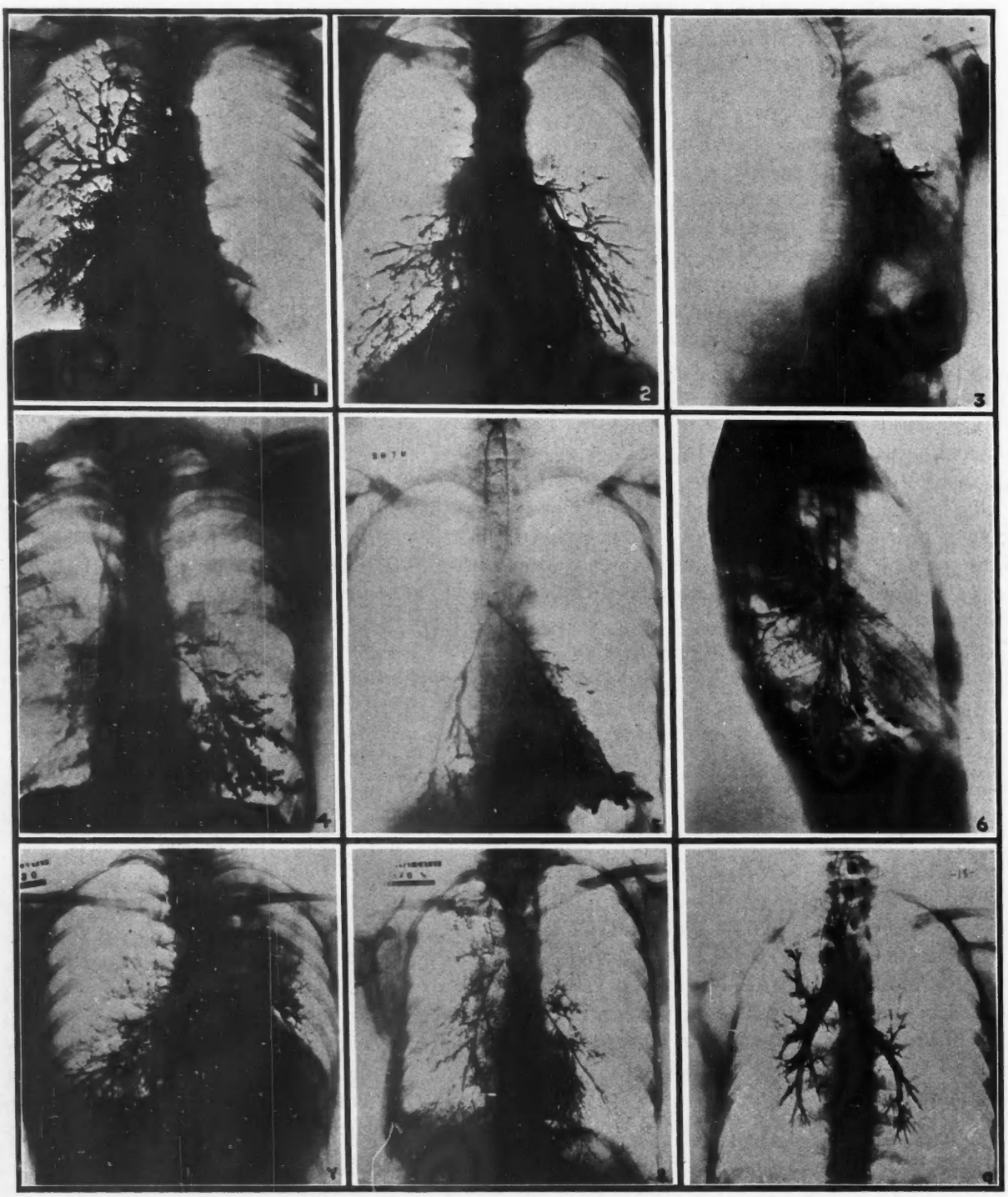
* A paper read at the Sixty-ninth Annual Meeting of the Canadian Medical Association, Section of Radiology, on June 23, 1938.

Finally, a method has been found that every roentgenologist can apply with a very simple technique. It has already been described in medical reviews. In the following descriptions and illustrations of the results obtained by us, you will readily perceive that the method is at the same time efficient and simple in operation.

The lipiodol is introduced through a small auricular speculum in the most suitable nostril. We attach to this speculum a small rubber tube, to avoid irritation of the mucous membrane. For this examination the patient can be seated or lying down, leaning to right or left, according to the side we desire to demonstrate; through this speculum we introduce three times at 5-minute intervals, 5 c.c. of the following solution.

℞

Cocaine Hydrochloride	1.00	gram
Potassium Sulphite	0.30	"
Carbolic Acid	0.10	"
Adrenaline 1/1,000	5.00	"
Cherry-laurel water	20.00	"
Distilled water	95.00	"



By pulling out the tongue of the patient strongly at each introduction of anæsthetic or lipiodol we avoid the reflex of swallowing, and the solutions can go easily through the larynx. Five minutes after the last injection of the anæsthetic the lipiodol is introduced in the same manner. With a little cooperation from the patient we are sure of success, but we have to take the picture in a hurry; there are only 4 or 5 minutes available before the beginning of expectoration.

The different positions in which the patient is exposed ensure the demonstration of the region suspected. There is no need to give narcotics beforehand, and no need to consider the age, as we have obtained success even with children only 5 year old.

The simplicity of the instrumentation in this method offers an easy success to every roentgenologist. The radiographic technique is the same as used, except that we add a little more intensity, to obtain a better contrast. This examination lasts at the most 15 minutes, and several of them can be under way at the same time.

The general contraindications are the same as for all other methods; acute or ulcerative tuberculosis with fever; lack of resistance of patient; recent hæmoptysis; and idiosyncrasy to iodine. We must confess, in spite of the opinion of several radiologists, that we never had any accident from iodism, although in this last method the lipiodol is in direct contact with the nasal mucous membrane.

Some operators prefer using a syringe instead of a speculum. We also tried a syringe, but we prefer the speculum because of a better control of the free flowing of liquids, and pressure on the liquids by the syringe is eliminated. The lipiodol must be heated to the human temperature, and the operator must observe this, to avoid disagreeable reactions in the patient.

Sometimes we had a lack of results when the bronchi were obstructed with secretion; after a clinical examination at the usual time of expectoration we succeeded in introducing the lipiodol after the vomicas.

During the last three years we have had the opportunity of making more than a hundred examinations by this last method. In this number we were obliged five or six times to repeat the operation because of lack of results, but with more confidence and a knowledge on the part of the patient that he would not suffer ill effects the second examination has always been successful. It is impossible to show you all these radiographic results, but we are glad to demonstrate some of them.

Fig. 1 demonstrates normal right bronchi.

We have some small cylindrical dilatations. Large dilatations are shown in Figs. 2, 3, 4 and 5.

We can see in Fig. 6 sacciform dilatations and the lateral view shows the usual posterior situation of these dilatations.

In Fig. 7, we can realize the attraction of left bronchi towards a superior shadow of the left lung.

Figs. 8 and 9, with full opacification of right and left bronchi, show in vertical and horizontal positions a small enlargement of right superior bronchi and the opacification of a diverticulum of the trachea.

STRYCHNINE POISONING.—"B.L.T." writes: A girl of 20 was brought to me at 2.50 a.m. one night with the story that she had just swallowed a chocolate she had herself filled with strychnine. Gastric lavage was begun soon after 3 a.m. immediately after the first emptying of the stomach, which seemed to contain very little; great difficulty was experienced owing to biting of the tube by the patient. This prevented any further lavage, and was thought to be due to the girl's obstinacy until, with dramatic suddenness, she became quite rigid in a strychnine convulsion. She was hurried off to hospital, where at 3.40 a.m. I gave her 10 c.c. of sodium evipan intravenously. At once she relaxed into a quiet narcosis. By 4 a.m. she was again having single convulsions, which by 4.15 were again becoming tonic, so that at 4.20 another 10 c.c. of evipan were given. At 5.25 a third dose of 10 c.c. was necessary; a smaller dose would have sufficed, because the injection was followed at once by exceedingly shallow respiration for about five minutes. However, when the effect of this last injection of evipan wore off there were only occasional violent twitches. The next day there was a little pyrexia but no muscle stiffness such as might have been expected after such violent contractions. The patient brought me later a little talc powder corresponding to the amount she thought she had taken from a bottle of strychnine nitrate in a laboratory to which she had access. A comparable quantity of strychnine nitrate was found to weigh 35 centigrams, and this the girl had put in the interior of a chocolate cream and had swallowed on an empty stomach, so that, allowing for a considerable margin of error, one can presume that she had taken a fatal dose.—From *Brit. M. J.*

STUDIES ON THE SOLUBILITY OF QUARTZ AND SILICATES

By COLIN C. LUCAS AND MARGERY E. DOLAN

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THE influence of metallic aluminum upon the solubility of quartz and upon the physiological response to inhaled siliceous dusts has been described recently by Denny, Robson and Irwin.[1] The interest aroused by the publication of their data suggested the advisability of reporting certain experiments which had been carried out in this laboratory previous to their report.

The work to be reported was undertaken to determine the solubility of quartz and several silicates when the minerals are in a finely particulate condition (similar to that encountered in dusty atmospheres). The minerals which have been studied include quartz, two feldspars (microcline and albite), muscovite ("white mica"), sericite and asbestos. The specimens were carefully chosen for homogeneity and were identified by mineralogists.*

When studying the solubility of any sparingly soluble substance of physiological significance, determinations should be made of both the *rate of solution* and the *limit of solubility* (*i.e.*, the final or limiting concentration which is attained when the solution is saturated and in equilibrium with an excess of the solute). In the case of silica it is not yet known whether the rate of solution or limiting concentration is of greatest significance. Data concerning both have been obtained. When considering silicates (as opposed to pure silica), one should not speak of the *solubility* of silicates (*e.g.*, the feldspars, asbestos, mica, etc.), since water does not dissolve them *in toto* (as it does simple salts), but, as a result of chemical reactions between the silicate and water differential solution (leaching) occurs, and certain portions of the complex silicates dissolve more rapidly than others, leaving behind a new silicate with new physical and chemical properties and probably new physiological effects. One can, however, determine the rate of leaching of the silica moiety of such complex silicates and this has been done in the present study. It remains for the pathologist to ascertain whether the portion which dissolves or the residue which is left behind is more deleterious. This communication deals only with the chemical aspects of the problem.

* We are indebted to Prof. T. L. Walker, of the Royal Ontario Museum of Mineralogy, Toronto, and Dr. W. A. Jones, Hollinger Gold Mines, Timmins, Ont., for gifts of pure minerals and for their kind cooperation in identifying specimens for us.

EXPERIMENTAL

Vessels.—The use of ordinary glass containers for these solubility studies was, of course, out of the question. The hard rubber bottles used for containing hydrofluoric acid proved suitable. Evaporations and fusions were done in platinum dishes and crucibles.

Methods.—The mineral powder and solvent (1 per cent suspensions, unless otherwise stated) were kept agitated by fastening the hard rubber bottles to a mechanical rocker in a water-bath at 37° C. At suitable intervals portions of the suspensions were removed for analysis. The sample was centrifuged at high speed to remove suspended material, the supernatant liquid was filtered through a No. 42 Whatman filter paper, and aliquots of the clear filtrate were analyzed.

The analytical methods used for determining the silica depended upon the nature and amount of material under examination. The colorimetric micro-method of King, Stantial and Dolan[2] was used to determine the amount of "free" silica (*i.e.*, silicate ion free to react with the reagents directly) in the dilute solutions obtained in the solubility studies. The same procedure, applied after evaporation of the solution and fusion of the residue with sodium carbonate, was used to determine "total" dissolved silica. The original mineral powders and the residue obtained after leaching were analyzed by the usual gravimetric procedures for silica, described in any textbook on silicate analysis. The other constituents of the mineral powder (iron, alumina, lime, magnesia, potash and soda) were determined by standard gravimetric methods.

QUARTZ

The quartz used in this investigation, the white massive variety found in veins and stringers in the Porcupine gold field of northern Ontario, was carefully picked for us by the technical staff of the McIntyre Mine. It was ground in a ball-mill to pass a 200-mesh sieve (size of openings, 0.074 mm.). The powder analyzed 98.5 per cent SiO_2, showing it to be derived from massive quartz of better than average purity.

By elutriation in water the powder was separated into fractions of different particle size. After removal of the coarser fractions in the usual way, the smaller particles (under 12 μ) were separated by repeated centrifugation at definite speeds for definite times. Particles under 0.5 μ were rejected as they were difficult to deal with, tending to form colloidal solutions. The results

TABLE I.

DISTRIBUTION OF PARTICLE SIZE IN THE QUARTZ POWDER

Fraction	*Particle size*	*Weight recovered*
1	above 35 μ	540 g.
2	20–35 μ	70 g.
3	12–20 μ	66 g.
4	8–12 μ	39 g.
5	5–7 μ	57 g.
6	0.5–3 μ	97 g.
	Total recovered	869 g.

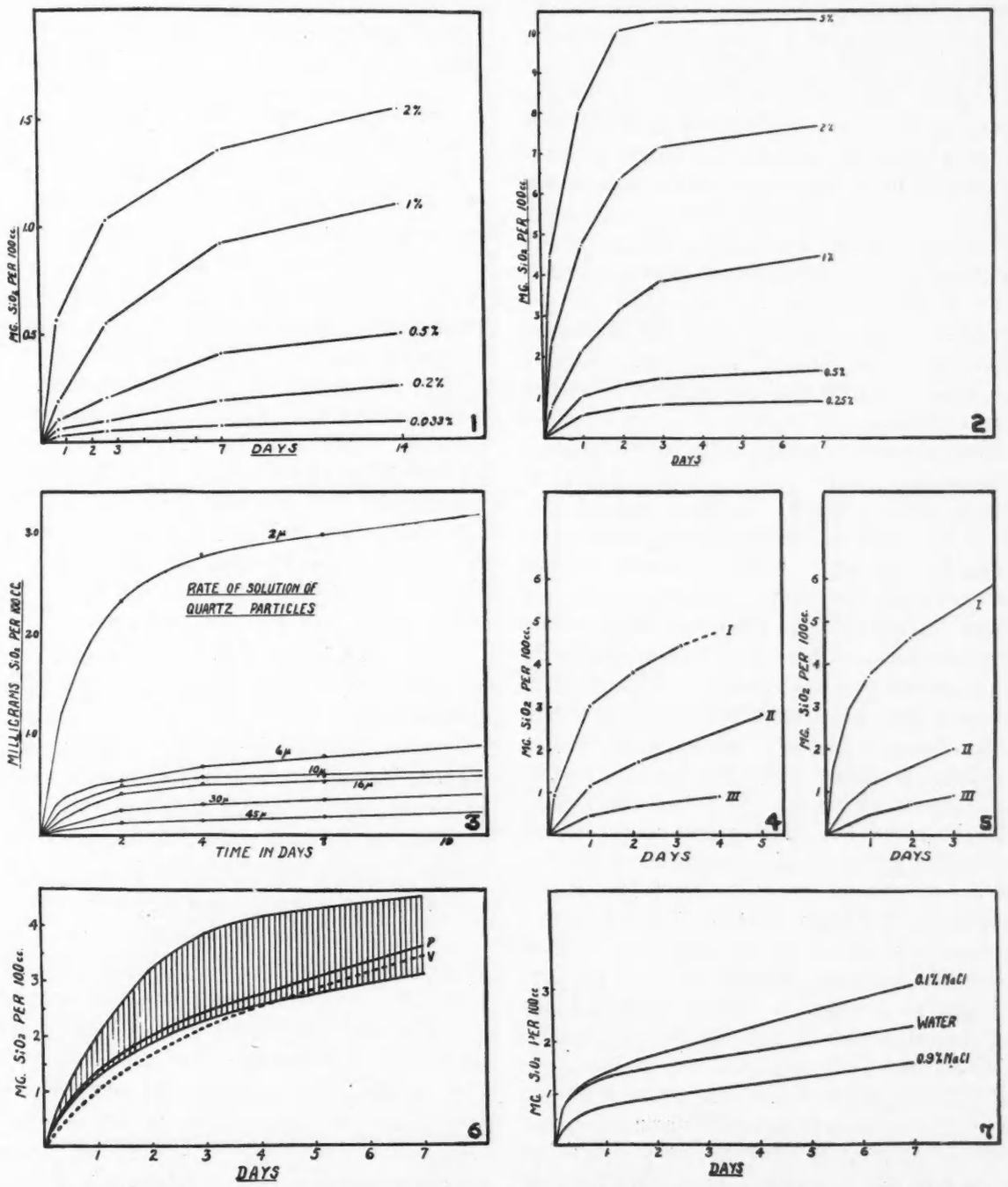

Chart 1.—Influence of quantity of powder on rate of solution of quartz. Figures at right hand side show concentration of suspension. Particles 5–7 μ. Temperature 37°. **Chart 2.**—Influence of quantity of powder on rate of solution and limit of solubility. Quartz particles 0.5–3 μ in size. The figures opposite right-hand end of each curve give the strength of the suspension used. **Chart 3.**—Effect of particle size on rate of solution. All suspensions 1 per cent in concentration. **Charts 4 and 5.**—Effect of repeated extractions of a quartz powder with water upon rate of solution. **Chart 4.**—Quartz particles 0.5–3 μ in size; 4.00 grams in 200 c.c. water; three extractions of same sample. **Chart 5.**—Same powder as used for data in Chart 4 but larger amount: 8.00 grams in 400 c.c. **Chart 6.**—"Solubility" of quartz in water and buffers. Curves to show variability of results. All suspensions 1 per cent; particle size 0.5–3 μ. Shaded area represents limits of variation of solubility of a quartz sample in water. V = 0.05 M veronal buffer (pH 7.0) as solvent. P = 0.02 M phosphate buffer (pH 7.0) as solvent. **Chart 7.**—Curves to show effect of sodium chloride solutions on solubility of quartz.

of the fractional sedimentation of one kilogram of the quartz powder are shown in Table I. The material lost in the fractionation, 131 g., consisted mainly of the finer particles, *i.e.*, under 10 μ.

(1) The Influence of the Quantity of Quartz Powder on the Rate of Solution

Since rates as well as limits of solubility were to be studied the quantity of the solid phase was varied to determine the best proportions to use in subsequent experiments. The fraction numbered 5 in the above table, 5–7 μ in size, was used for this preliminary study. Suspensions of different strength, from 0.033 to 2 per cent, were made up in 75 c.c. portions of distilled water and kept agitated at 37° C. Aliquots were removed for analysis at the end of 16 hours, 66 hours, 7 days and 14 days. The results, which are best presented graphically, are shown in Chart 1.

As might be expected, the initial rate of solution is increased by having a larger quantity of solid phase present. What was not expected was to find the curves flattening out as they do at such different levels. When solubility data are plotted as in Chart 1 a horizontal line indicates one of two things: either the solution is saturated and in equilibrium with the excess solute (the solid phase) or all the solid has dissolved and therefore no further increase in concentration could occur. The latter explanation could be ruled out in this case since all the suspensions still showed an undissolved residue. The data from the first suspension (the lowest curve in Chart 1) show that when 25 mg. of this fine quartz powder are suspended in 75 c.c. of water only 0.02 mg. dissolve during the first 16 hours, *i.e.*, enough to make a 0.028 mg. per cent concentration. During the period from the 7th to the 14th day only 0.012 mg. go into solution. If the lowest curve only were available one would naturally explain the marked decrease in the rate of solution after the first day as being due to the close approach to saturation (for there is still present essentially the same amount of undissolved solid). But this explanation cannot be correct, since the 2 per cent suspension (the uppermost curve in Chart 1) reached a concentration almost twenty times greater (*viz.*, 1.55 mg. per 100 c.c.) and was not yet saturated.

A similar series of determinations was made, using the finest particles obtained in the fractionation of the original quartz powder, *i.e.*, fraction 6 (0.5-3 μ) of Table I. The bulk of the particles were 1 to 3 μ in size, although a small percentage were as fine as 0.5 μ and occasional particles up to 6 or 7 μ could be seen. Suspensions from 0.25 to 5 per cent strength were prepared in 200 c.c. portions of distilled water. Samples were removed for analysis at the end of 3 hours and 5 hours, in the case of the three stronger suspensions. Aliquots from all suspensions were analyzed at the end of 1, 2, 3 and 7 days. The results are presented graphically in Chart 2.

A series of curves of the type shown in Charts 1 and 2 is generally an indication of the presence of two (or more) compounds present in the solid phase, *i.e.*, they suggest the presence of impurities.

The curves are apparently not solubility curves of pure quartz, although our original mineral analyzed almost 100 per cent SiO_2 and the deficit could in part be explained by traces of iron dust (from the grinding process). The iron was removed during the elutriation procedures. Optical examination of the quartz powder failed to reveal any appreciable lack of homogeneity, and attempts to remove non-quartz material in a centrifuge by gravity separation in heavy liquids of densities just greater and just less than quartz failed to show the presence of more than traces of other minerals.

From the point of view of the physical chemistry of the system the possibility of the presence of impurities is disturbing. We were primarily interested, however, in the rate of solution (in body fluids) of siliceous minerals as they occur in nature, so the experiments were continued, using the same powders but without any further attempt being made to purify them.

The data in Charts 1 and 2 indicate that a 1 per cent suspension of quartz powder of the particle size in which we were interested (*i.e.*, under 10 μ) will give quantities of silica in solution that are easily measured, and so for most subsequent experiments 1 per cent suspensions were used. The smaller the particles, the greater the rates of solution and limits of solubility, as is evident by comparing Charts 1 and 2. The values are reproducible within about 10 per cent provided all the conditions remain constant. Any change in the source of the quartz, differences in treatment of the mineral during preparation of the powder, changes in the ratio of powder to water, variation in particle size, or any other change affect the steepness of the rate of solution curve and the level of the plateau reached. The effect of some of these factors has been studied in detail and the findings are given in the following sections.

(2) EFFECT OF PARTICLE SIZE ON THE RATE OF SOLUTION OF QUARTZ

The rate of solution of any particulate substance is related to the area exposed to the solvent. Assuming spherical particles of radius r and density d, the area of one gram of material is $\frac{3}{r.d}$. One per cent suspensions of quartz particles of different sizes (fractions 1 to 6 of the material referred to in Table I) were made up in hard rubber bottles, and the rates of solution at 37° C. were determined as in the previous experiment. The findings are presented in Chart 3. The rate of solution during the first 24 hours is almost directly proportional to the areas exposed. The final concentration seems to bear a relation to the initial rate of solution.

It will be of considerable interest to those engaged in studies on silicosis to note the sudden marked increase in the rate of solution of these quartz particles when the size becomes less than 5 μ. The well-known greater health-hazard from very finely particulate silica (the dangerous size is usually given as "under 10 μ") may possibly be related to the greatly increased rate of solution of the quartz under these conditions.

It is pertinent to mention here a series of solubility determinations made on pure silica prepared by neutralizing a solution of sodium silicate (C.P.) with hydrochloric acid. The silica gel was washed repeatedly (by shaking with water) until the chloride test was negative. A portion was analyzed for its SiO_2 content and the remainder was divided into three parts. One was dried at 110° overnight, and another (after this preliminary drying) was ignited at 500° for several hours; the third portion was not treated in any way. Sufficient of each to give 2.00 g. of SiO_2 was suspended in 200 c.c. of water in a hard rubber bottle. Aliquots were removed, filtered, and analyzed at daily intervals. All three gave solutions containing 15 mg. per cent SiO_2 at saturation, the untreated gel producing this concentration in 3 days, the material dried at 110° in 5 days, and the ignited material in 7 days.

(3) REPRODUCIBILTY OF RESULTS

Before one can draw reliable conclusions regarding the influence of the presence of salts or proteins or of pH variations on the solubility of quartz in aqueous media the degree of reproducibility of results in pure water must be definitely established. In the early stages of this study it was our custom to run a "distilled water control" at the same time and under conditions identical with those of the "test solution" (*e.g.*, blood serum, urine, etc.). It was believed that by comparing the amount of silica going into solution in the "test solution" with that dissolving in the "control" a measure of the relative efficiencies of the media as solvents could be ascertained. But it soon became apparent that the "controls" did not give identical results in all cases, in spite of the fact that every care was exercised to keep the conditions exactly the same in all experiments. Neglect to consider this point in the early stages of the work led us to conclusions which later proved unjustified. This question of reproducibility, therefore, received attention and, as we believe the point to be one of some importance, particularly in this study, the findings are presented in detail.

True equilibrium (saturation) is not attained in many weeks, and it seemed hardly practicable to carry all the experiments for such long periods. The following data do not refer to equilibria therefore but to the reproducibility of the quantities in solution, under standard conditions, in a given time. Since it had been found that the solutions appeared to be almost saturated in one week (Chart 2) the time chosen for the following experiments was 7 days.

Two-gram portions of fraction 6 (quartz particles 0.5 to 3 μ in size) were suspended in 200 c.c. distilled water and the mixtures were kept agitated at 37° in closed hard-rubber bottles. The results obtained are presented in Table II, arranged in order of increasing magnitude.

TABLE II.

REPRODUCIBILITY OF RESULTS

Quantity of SiO_2 in solution (mg. per 100 c.c.) after 7 days, in a 1 per cent suspension* of quartz particles 0.5–3 μ in size

2.83	3.29		3.80
2.84	3.30		3.97
2.98	3.34		4.00
3.08	3.59		4.30
3.19	3.62		4.44
3.20	3.75		
3.28	3.78	Mean	3.50
		Median ...	3.34

* NOTE.—It might be well to emphasize the fact that 1 g. of powder in 100 c.c. and 2 g. in 200 c.c. do not give the same values although both are 1 per cent suspensions. (Compare Charts 4 and 5). Four grams of this same fraction (6) in 400 c.c. water gave a 7-day value of 5.06 mg. SiO_2 per 100 c.c.

Even under carefully standardized conditions the results are not reproducible within very narrow limits. The error involved is not an analytical one; duplicate analyses on any particular solution agreed within 2 per cent. The variation is probably due to an irregular distribution of particles of slightly different size in the different portions of powder used for

each experiment. It is obvious from Chart 3 and the calculated areas that a change in the ratios of smaller to larger particles in different samples of a fine powder, such as fraction 6, would account for irregularities of the magnitude noted.

Since the size of the particles affects both the rate of solution and the limit of solubility it is not surprising that in the experiments described above the amounts of SiO_2 found in solution at a given time (*viz.*, the 7th day) are not always exactly the same.*

LEACHING OF QUARTZ POWDERS

The fact that with different quantities of quartz powder different limiting solubilities were noted (Charts 1 and 2) suggested the presence of a small amount of a more soluble silicate present as an impurity in the quartz. To examine this possibility the following experiments were performed.

A 4.00 g. portion of the fine quartz powder was suspended in 200 c.c. of freshly distilled water and kept agitated in a closed hard-rubber bottle at 37° for three days. Aliquots (5.0 c.c.) were removed for SiO_2 determination at the end of 4, 24, 48 and 72 hours. The material was then removed from the bottle, centrifuged at high speed to throw down the quartz particles, the supernatant liquid was poured off, and the powder was taken up in 200 c.c. of fresh distilled water and returned to the bottle. This procedure was repeated once more. Three extractions (and three "rate of solution" curves) were thus obtained. The data are presented graphically in Chart 4.

The curves in Chart 4 reveal a marked drop in the rate of solution and in the limiting solubility when the same quartz powder is used repeatedly. There are several possible explanations: (1) the presence of a small amount of a readily soluble siliceous impurity which is removed after several extractions with water; (2) the presence of a small amount of very fine silica particles, under 0.5 μ in size, not readily detected with the microscope but making their presence known in this way; (3) some change in the surface of the quartz dust particles on exposure to water, rendering them less soluble. Chemical analysis of the extracts should help to decide between explanations 1 and 2. The third possibility is rendered very improbable by the finding (p. 127) that hydrated silica is more readily soluble and reaches a greater limiting concentration than crystalline quartz (the curves should be increasing in steepness rather than decreasing if hydration were an important factor). Any other change in the surfaces is unlikely.

The experiment was therefore repeated, using 8.00 g. quartz powder suspended in 400 c.c. portions of water, but this time the extracts were kept for examination. The details of the solubility results are given in Chart 5 and the analytical data pertaining to the extracts follow. The extracts were centrifuged, the supernatants were filtered through No. 42 Whatman paper; 300 c.c. portions of each were combined, evaporated to dryness in platinum, and brought to constant weight at 110°. The residue was then heated in an electric muffle furnace to 500° until at constant weight. It was converted to a sulphate ash, silica was determined by volatilization with hydrofluoric acid, and water-soluble sulphates were finally leached out of the residue leaving the insoluble oxides behind.

TABLE III.

Analytical Data on 900 c.c. Aliquot of Extracts from Fine Quartz Powder

Total residue (dried 110°)	148.6 mg.
" " (dried 500°)	120.3 mg.
Therefore combined water = 19.0 per cent	
Wt. of sulphate ash	126.4 mg.
Therefore weight of SO_3 taken up = 6.1 mg.	
Wt. of residue after $HF + H_2SO_4$ treatment (metal sulphates) ..	24.0 mg.
Therefore weight of SiO_2 volatilized	102.4 mg.
Therefore SiO_2 = 68.9 per cent	
Wt. of water-soluble sulphates	19.5 mg.
Therefore weight of water-insoluble oxides ..	4.5 mg.
Therefore $Al_2O_3 + Fe_2O_3$ = 3.0 per cent	
Therefore $K_2O + Na_2O + CaO + MgO$ = 9.1 per cent	

Obviously the powder cannot be considered as pure quartz, and therefore the data represented by the curves in Charts 1, 2 and 3 are not true values for quartz. The lower curves

* Unless one is willing to spend considerable time on the somewhat difficult separation of these fine particles into still more uniform size-groups results more constant than the above can hardly be expected. The object of our study has been to collect data which may be of importance in pathological studies, and while a more elaborate investigation is justified from the point of view of the physical chemistry of the system, we feel that such an investigation hardly comes within our field.

An examination of the data in Table II revealed an unexpected source of difficulty in obtaining reproducible results. When the solubilities were arranged in order of the date of their determination it was discovered that in general the low values were all recently determined and the higher values were older ones, *i.e.*, determined shortly after the powder had been elutriated. A re-examination of other data in our records revealed that this decrease of solubility with age was general. Further work on this aspect of the problem is at present being carried on in the Department, and therefore the matter will not be discussed in more detail at this time. Briscoe, Matthews, Holt and Sanderson[3] have recently reported finding fresh siliceous dusts to be more reactive than after exposure to air.

(labelled III) in Charts 4 and 5 probably do represent with fair accuracy the rate of solution of quartz.

Studies such as the above indicate that the "solubility" of the mineral quartz, (and probably certain other siliceous substances) depends upon which particular sample is chosen for investigation, since the bulk of the material going into solution is not from the mineral which is supposedly being studied, but from the more soluble concomitant minerals present in traces.

FELDSPARS

Solubility or, more correctly, leaching studies have been made on a typical feldspar, microcline, $KAlSi_3O_8$. The sample chosen for this work was a particularly fine specimen of unusual purity (by crystallographic examination) presented to us by Dr. T. L. Walker, of the Royal Ontario Museum of Mineralogy. The mineral was ground in a ball-mill to pass a 200-mesh sieve.

A portion was elutriated in water to obtain fractions of different particle size. Before it was realized how much microcline particles are affected by treatment with water a series of solubility determinations were made on these fractions. The results were quite unexpected, in that the smaller particles gave up less silica to the solution than did the larger ones. This surprising observation led to a study of the leaching action of water on microcline.

It was felt that the most accurate information concerning the action of water on microcline would be obtained by studying the material which was extracted. To determine the rate of leaching of silica, a sample of the original, untreated microcline powder was shaken with portions of water; small aliquots of the filtered extracts were used to determine dissolved silica, the remainders were evaporated to dryness (constant weight at 110°) to determine "total solids" dissolved by the water. The results of a typical experiment are shown in Table IV.

These figures suggest a rapid leaching of some relatively soluble constituent resulting in a change in the surfaces of the particles such that a surface becoming increasingly richer in silica is exposed to the solution. There is some evidence that a reaction of the following type occurs.

$$K_2O.Al_2O_3.6SiO_2 + 2H_2O \longrightarrow H_2O.Al_2O_3.6SiO_2 + 2KOH$$

on the surfaces, and that subsequently a resulting alkaline solution acts on both unchanged microcline and on anhydrous aluminum silicate.

TABLE IV.

LEACHING OF SILICA AND TOTAL SOLIDS FROM MICROCLINE BY WATER

8.00 g. powder in 400 c.c. portions of water; total residues on 300 c.c. aliquots; silica values on smaller aliquots.

Extract No.	*Duration*	*Total solids*	*"Free SiO_3" expressed as SiO_2 mg. per 100 c.c.*	*Total SiO_2 mg. per 100 c.c.*	*Total SiO_2 per 300 c.c. aliquot*
1	2 hours	18.6 mg.	0.28	0.66	1.98 mg.
2	4 "	13.0 "	0.35	1.31	3.93 "
3	3 days	21.7 "	1.41	2.70	8.10 "
4	2 "	18.0 "	1.12	2.11	6.33 "
5	2 "	9.8 "	1.02	1.04	3.12 "
Total solids in 1500 c.c.		81.1 mg.			23.46 mg.

Therefore total solids extracted by 2,000 c.c. water from 8.0 g. microcline in 1 week = 108.1 mg.

The "solids" left by evaporation of the extracts were analyzed for combined water, (about 10%) silica, (about 30%), alumina (about 12%), lime (about 3%) and magnesia (faint traces) and attempts were made to determine potash and soda. By difference they should constitute nearly 45 per cent of the solid residue. By actual analysis, we found about 35 per cent only, but a

TABLE V.

LEACHING OF MICROCLINE

60 g. mineral powder in 1,200 c.c. portions of water. One litre aliquots of each extract evaporated. Residues weighed, combined and analyzed.

Extract No.	*Hours*	*Final pH*	*"Total SiO_2" in extract mg. per 100 c.c.*	*Total solids (mg. in litre aliquot)*	*Analysis of solid residue from extracts 1 - 4*
1	1	9.85	3.5	207.7	Total solids (dried 110°) 487.5 mg.
2	2	10.0	4.5	118.7	Loss at 500° (water) 12.0%
3	1.5	9.45	+	161.1*	SiO_2 27.6%
4	16	9.78	1.2		Al_2O_3 17.0%
					Fe_2O_3 2.4%
5	5	9.75	2.16	rejected	CaO 3.0%
					62.0%
					MgO trace
					K_2O, Na_2O † (by diff. therefore) 38.0%

+Extract slightly cloudy.

*Part of fourth extract added to dish by error before weighing solids of third, so only combined weight obtained.

†Quantitative determination of K_2O and Na_2O in the filtrate from the magnesium determination is difficult; an attempt to fume off ammonium salts led to mechanical loss of some of the alkali chlorides. The ratio of K_2O: Na_2O in the residue obtained was about 4:1 in this experiment.

check on the procedure which we were using revealed considerable loss (either by volatilization of the chlorides or mechanically). The value obtained by difference is in this case undoubtedly more reliable than the figures actually determined by analysis. The ratio K_2O:Na_2O which we found in the several attempts to determine the alkalies in these residues was about 4.5:1.0 (by weight, not in molecular proportions).

The results of one larger scale leaching experiment in which more complete data were obtained will be reported briefly.

Into each of three hard rubber bottles were put 20 g. of the original, untreated microcline powder and 400 c.c. of CO_2-free water. The mixtures were kept agitated at 37°. At short intervals (a few hours) the mixtures were centrifuged and fresh water was added to the powder. The pH of the extracts was determined immediately (with a glass electrode), the slightly cloudy solutions were filtered through No. 42 Whatman papers, and one litre portions of each extract were evaporated to dryness in platinum. Total silica was determined on a separate small portion of each extract. The results are shown in Table V.

The amount of material extracted by the water falls off very rapidly. A marked differential leaching of alkalies from microcline by water is apparent. The extracts are strongly alkaline (pH 9.5-10.0), and if exposed to the atmosphere absorb carbon dioxide with a fairly rapid fall in pH to about 8.5.

Finally, a sample of very fine microcline powder (particles 1–3 μ) was leached in the same way to see to what extent the rate of leaching and the nature of the extract varied with the mean size of the microcline particles used. These fine particles were obtained by centrifugal elutriation of the original powder in mineral oil; the oil was removed by washing the powder repeatedly with absolute ether, and the microcline was finally dried *in vacuo*. A 7.0 g. portion, suspended in 350 c.c. of CO_2-free water in a hard-rubber bottle was kept agitated at 37°, and the water was changed after the extractions had proceeded for the times shown in Table VI.

TABLE VI.

LEACHING OF VERY FINE MICROCLINE PARTICLES

7.0 g. powder in 350 c.c. portions of water.
Used 300 c.c. aliquots for analysis.

Extract No.	*Duration*	*Total solids mg. in 300 c.c. aliquot*	*Rate of leaching mg. per hour*	*Analysis of residue*	
1	3 hours	58.2	19.4	Combined H_2O	5.2%
2	6 "	99.7	16.6	SiO_2	36.2%
3	20 "	68.4	3.2	Al_2O_3 (+Fe_2O_3)	15.0%
4	1 week	51.6	0.3	CaO	3.0%
	Total	277.9		Accurately determined	59.4%
				K_2O+Na_2O (by diff.)	40.6%

The results obtained in this experiment support those previously found, *i.e.*, a rapid initial extraction of material; the initial rate is not only much greater than in the case of the coarser powders but it is maintained for a longer time. The substance obtained by evaporating the extracts is somewhat richer in alkalies and silica than in the large scale experiment on the coarser powder and is poorer in alumina and combined water, but its composition is essentially the same as found in the previous leaching experiments.

These experiments have been described in some detail in order to emphasize the fact that fine particles of some silicate minerals are acted upon with rapidity by water at body temperature. More or less base is removed and a new mineral (with new physical, chemical and probably new physiological properties) remains. The term "solubility" as applied to silicates is a misnomer; the word "leaching" seems appropriate to use in this connection.

SOLVENT ACTION OF SALT SOLUTIONS ON QUARTZ AND SILICATES

The rates of solution of quartz particles 1–3 μ in size in 0.02 and 0.002 M phosphate buffer (pH 7.0) and in a 1 per cent and 0.1 per cent sodium-veronal buffer (pH 7.0) were determined. The presence of these salts did not affect appreciably the solution of the quartz particles as the curves (Chart 6) lie within the area which represents the reproducibility of "rate of solution curves" in pure water.

The influence of sodium chloride (0.1 and 0.9 per cent) was investigated, using a powder the particles of which were 5–7 μ in size. No significant difference was found between the rate of solution in pure water and in the salt solutions (Chart 7).

Sodium bicarbonate solution (0.1 per cent) did influence the rate of solution of quartz. Using 1 per cent suspensions of particles 5–7 μ in size, the rate of solution of quartz in the bicarbonate solution was found to be four times that in the water during the first few days. At the seventh day the amounts of SiO_2 in the two solvents were 1.90 and 0.63 mg. per 100 c.c. respectively, on the fourteenth day 2.44 and 0.88 respectively, and at the end of the experiment (22 days) the values were 2.44 and 1.03 respectively.

In the case of microcline 1 per cent suspensions of particles 1–3 μ in size (elutriated in mineral oil and repeatedly washed with ether dried over metallic sodium) were used. The solvent action of 0.1 and 0.9 per cent sodium chloride and 0.1 per cent sodium bicarbonate

solutions was compared with that of pure water. The amount of SiO_2 going into solution (not the total solids) was determined. Although the curves differed slightly it is doubtful whether the salt can be said to have any influence on the rate of leaching of silica from microcline. The sodium bicarbonate solution did not extract SiO_2 any more rapidly from microcline than did water.

A similar experiment with a 1 per cent suspension of very finely divided asbestos gave similar results—sodium chloride and bicarbonate exerted no appreciable influence on the rate of leaching of SiO_2, as judged by the amounts of SiO_2 in solution on the 7th and 14th days. During the first 24 hours the amount of SiO_2 in solution reached a maximum value (0.07 mg. per cent in pure water), but apparently the silica was again precipitated as a result of secondary reactions, for the values fell steadily until the 9th day (0.03 mg. per cent SiO_2 in pure water) and then tended to increase slightly (0.05 mg. per cent on 14th day). During the first day the bicarbonate appeared to be leaching SiO_2 quite rapidly (0.13 mg. per cent) but the silica largely disappeared from solution just as in the water and saline extractions.

A specimen of white mica was powdered as finely as possible (200 mesh) but owing to its flaky nature elutriation was difficult and the material used for the leaching experiments was quite heterogeneous as regards size of particles. It proved to be very resistant to leaching. After 7 days only 0.40 mg. per cent of SiO_2 was found in solution. Sodium chloride did not exert any appreciable influence on the leaching of SiO_2 from mica; sodium bicarbonate (0.1 per cent) was also without significant influence in this regard. A sample of sericite (an acicular form of mica) supplied by Dr. W. A. Jones, also proved to be very insoluble in water.

SOLVENT ACTION OF URINE AND BLOOD SERUM ON QUARTZ AND SILICATES

A quantity of mixed, fresh urine was adjusted to pH 7.0 and 1 per cent suspensions of quartz, microcline, albite, asbestos, mica and sericite were made in it. The amount of SiO_2 in solution was determined at frequent intervals. The urine dissolved quartz and leached SiO_2 from silicates at about the same rate as does water. In every case, commencing about the fourth day, there was a disappearance from the solutions of part of the dissolved SiO_2. The mechanism of this change has not been studied.

Blood serum was used as solvent in a similar experiment with very similar results.

DISCUSSION

The determination of the "solubility" of quartz offers innumerable technical difficulties. A few workers in this field have recognized some of these but many have apparently overlooked them. In the first place, the quantity of dissolved material is very minute, making the analysis one of some difficulty unless a micro method is available. The presence of finely divided (colloidal) particles in the solution will give high results if a gravimetric procedure (evaporation to dryness) is used. The high figures reported by some of the early workers may possibly be explained in this way. Ultrafiltration (forcing the solution through membranes by high pressures) or very high speed centrifugation (about 20,000 r.p.m.) is necessary to remove the finer particles (King[4]; King and McGeorge[5]).

A colorimetric procedure (such as has been used in this work) in which only the molecularly dispersed silica can react (?) overcomes the positive errors due to suspended matter, but if there is much colloidal material present, a negative error may creep in owing to the difficulty of matching a clear standard with an opalescent test solution.

Besides the technical difficulties there are theoretical considerations which complicate the interpretation of the solubility data when they are obtained. Most samples of quartz powder when suspended in water give solutions which do not obey the classical phase rule relationships. For example, the quantity of silica in solution at (apparent) equilibrium depends not only upon the size of the particles and their previous history, but also upon the amount of solid added; and, further, addition of more quartz powder to an apparently saturated solution causes an increase in the amount in solution. These phenomena are usually indications of the presence of impurities in the material under examination, yet the quartz powders analyzed practically 100 per cent SiO_2. While re-suspension of the powders in fresh solvent sometimes results in a solution almost equal in concentration to the original solution, if the

process is repeated often enough both the rate of solution and limiting solubility decrease and become relatively constant. This finding probably means that the "apparent solubility" of "pure quartz", as ordinarily determined, is really a measure of the impurities in the specimen. If this be so, the true solubility of pure quartz is very much smaller than most of the figures given in the literature would suggest. It is beyond the scope of this paper to discuss the possibility of changes at the surfaces of the particles during prolonged exposure to water and the possibility of polymerization of the silicic acid once it has dissolved. Such changes might account for some of the results obtained just as well as would the "explanation" based upon the presence of impurities. While the true solubility of silica may be as yet unknown, much data of value to the pathologist and others interested in silicosis have been accumulated.

SUMMARY

Water, salt solutions, urine and blood serum all dissolve small amounts of silica from quartz. The "apparent solubility" of quartz is usually much greater than its real solubility, because of the presence in the native quartz mineral of impurities which are either more soluble in themselves or render the quartz more soluble.

The action of water and aqueous solutions in general upon silicates is not one of simple solution but of differential leaching. Removal of base, leaving a residue richer in silica, is the usual result.

REFERENCES

1. DENNY, J. J., ROBSON, W. D. AND IRWIN, D. A.: The prevention of silicosis by metallic aluminum, *Canad. M. Ass. J.*, 1937, 37: 1.
2. KING, E. J., STANTIAL, H. AND DOLAN, M.: The excretion of administered silica, *Biochem. J.*, 1933, 27: 1007.
3. BRISCOE, H. V. A., MATTHEWS, J. W., HOLT, P. F. AND SANDERSON, P. M.: A note on some new characteristic properties of certain industrial dusts, *Trans. Inst. Mining & Metallurgy*, 1936-37, 46.
4. KING, E. J.: Solubility of silica dusts, *Nature*, 1937, 140: 320.
5. KING, E. J. AND MCGEORGE, M.: The solution of silica and silicate dusts in body fluids, *Biochem. J.*, 1938, 32: 417.

THE INCIDENCE OF ANÆMIA IN WOMEN OF THE LOW INCOME CLASS

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CASE-FINDING has been utilized in many fields of preventive medicine but its application to the study of the frequency of anæmia in large groups of adults has been rather limited. Stimulated by the work of Davidson, Fullerton and Campbell,[1] who found that anæmia occurred very often in women belonging to the poorest classes in Aberdeen, a similar investigation was conducted by the Child Welfare Association of Montreal at the suggestion of Dr. J. C. Meakins, Professor of Medicine, McGill University.

As stated in this report 1,451 parous women of the child-bearing age, representing the poorer classes of the population in the widely separated areas of Montreal, have been examined with special reference to the incidence of anæmia. These persons were volunteers obtained through the Child Welfare clinics. On no occasion did any women present themselves because of any symptoms of ill-health. They were members of families in which the wage-earners were unemployed or in which the monthly incomes were less than one hundred dollars.

Each subject had a red blood count and a hæmoglobin estimation. The number of pregnancies, the intervals between pregnancies, and the history of any profuse menstruation or any abnormal prolonged uterine bleeding were also recorded. The hæmoglobin estimation was determined by the Sahli hæmoglobinometer in which the reading of 100 per cent of hæmoglobin was standardized to correspond to 15.6 g. of hæmoglobin per 100 c.c. of blood. The accuracy of the hæmoglobinometer was repeatedly checked.

It is generally accepted in the literature that the normal range of hæmoglobin for adult women is from 13 to 14 g. per 100 c.c. of blood. Davidson, Campbell and Fullerton[1] in their studies used 13.5 g. as suggested by Price-Jones. This agrees with 86.5 per cent hæmoglobin on the Sahli scale. Anæmia was considered to be present in this study if the hæmoglobin level was less than 80 per cent, which is equivalent to 12.5 g. of hæmoglobin.

Of the 1,451 cases 824 (56.8 per cent) had normal hæmoglobin levels, and 627 (43.2 per cent) exhibited various degrees of anæmia with hæmoglobin levels less than 80 per cent. There were 377 persons (25.9 per cent) with hæmo-

TABLE I.
DISTRIBUTION OF CASES AT VARIOUS HÆMOGLOBIN LEVELS

Hgb. per cent	*25/29*	*30/39*	*40/49*	*50/59*	*60/69*	*70/74*	*75/79*	*Over 80*
Number of cases	1	8	14	41	124	189	250	824
Per cent of total	0.1	0.5	1.0	2.8	8.5	13.0	17.2	56.8

globin levels 74 per cent or less, that is under 11.5 g. of hæmoglobin. Moderate anæmia (hæmoglobin 60 to 69 per cent or 9.4 to 10.8 g.) was present in 124 cases (8.5 per cent), and severe anæmia (less than 60 per cent or 9.4 g. of hæmoglobin) was demonstrated in 64 cases (4.5 per cent). The anæmia was of the hypochromic type in all instances, excepting 21 cases in which the anæmia was of the hyperchromic form. One hundred and nineteen women were seen during early pregnancy and 67 of these had hæmoglobin levels less than 75 per cent. However, the majority of such women were retested one year after the termination of the pregnancy and the same degree of anæmia existed.

The diversity of methods used for hæmoglobin determinations and the reported differences in the hæmoglobin levels in various countries make it difficult to compare the results of other studies. Davidson, Campbell and Fullerton employed the standards for hæmoglobin estimation established by Haldane, in which 100 per cent was equivalent to 13.8 g. of hæmoglobin. After converting their findings to the scale used in this study the incidence of anæmia in the Montreal group was found to be much less than in the Aberdeen series. In the latter study there were 603 parous women in the age-group of 15 to 44 years, and of these 88 per cent fell below the standard of 13.5 g. of hæmoglobin for normal women, 48 per cent below 11.6 g.; 17 per cent had moderate anæmia (9.6 to 10.8 g.); and 16 per cent had severe anæmia (less than 9.6 g. of hæmoglobin).

Heath and Patek[2] reported that 37 per cent of 1,168 women admitted to the wards of the Boston City Hospital in 1932 had a reduced hæmoglobin. Of 1,235 women in the medical wards of a clinic in Leipzig, Germany in 1932 there were 23 per cent with lowered hæmoglobin.[3] MacKay[4, 5] has concluded that more than two-thirds of the women of the hospital class in London could be considered anæmic and that about 50 per cent of the infants of the same class were anæmic.

Fullerton[6] noted that the hæmoglobin percentage curve for the non-pregnant women fell gradually throughout the reproductive period, and that it was well below the normal standard

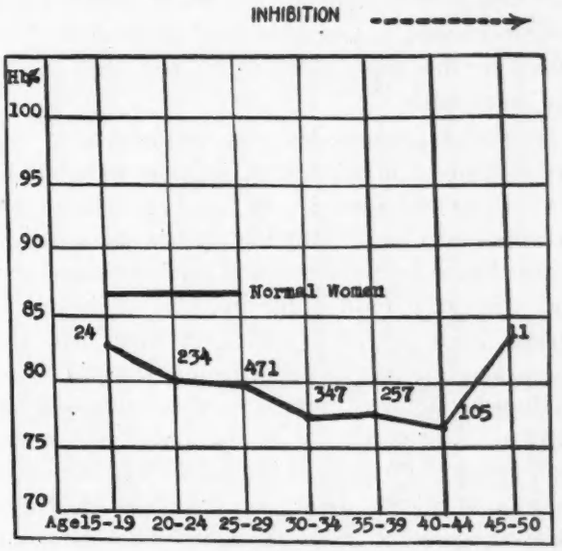


Chart 1.—Demonstrating the inverse relationship between age and anæmia from puberty to the menopause.

for women. After the menopause there was a marked rise in the average hæmoglobin. This finding was observed in this series (Chart 1). From puberty to the menopause the drains upon the iron stores are the greatest because of the normal physiological iron requirements of the female for growth, menstruation, pregnancy and lactation. The possibility of the hæmoglobin being reduced will be the greatest at these times, particularly if the demand for iron is greater than the supply of iron to the body.

The statistical study of 1,000 records in this series revealed that there was no conclusive evidence of any definite correlation between the presence of anæmia in an individual and the number of pregnancies of that individual. There was also an absence of any significant correlation between the incidence of anæmia and the history of hæmorrhage, profuse menstruation, or the interval between pregnancies. Similar conclusions were arrived at by Fullerton.[6] Since women of the older-age groups have a greater incidence of anæmia than younger women it is obvious that the average hæmoglobin levels of women with many previous pregnancies will be lower than those with few previous pregnancies, since the average age of the former will be greater than that of the latter. Fullerton com-

ments that in many cases menstruation constitutes a greater demand for iron than pregnancy and that this fact explains why there is no positive correlation between the degree of parity and the incidence of anæmia in women of the same age-group. If menstrual loss exceeds the available intake of iron as it does in the poorer classes, a negative iron balance is produced by this cause alone which will continue to the menopause.

Repeated pregnancies may contribute to the production of deficiency of iron in ways other than those considered. It has been shown by Strauss and Castle[7] that the gastric secretion of hydrochloric acid is depressed during pregnancy and this may reduce the amount of iron absorbed from the diet, which, in turn, will increase the liability to hypochromic anæmia. The etiological factor of anacidity was considered of extreme importance by Heath and Patek.[2] In their series of 60 cases of idiopathic hypochromic anæmia anacidity after the injection of histamine was present in 75 per cent. They stressed also the frequency of pathological loss of blood in this syndrome. Of the 60 cases only 6 patients escaped the discovery of pathological loss of blood which could account for the presence of deficiency of iron.

The approximate protein diet of 50 cases with hæmoglobin levels between 75 to 100 per cent was compared with 50 cases with hæmoglobin levels between 25 to 65 per cent and it was found that less protein in the form of beef, pork, liver, chicken and eggs, was consumed by the anæmic persons. Approximately the same amounts of fish and milk were used by the two groups.

The estimation of the amount of hæmoglobin is important from the point of view of iron deficiency because it gives fundamental information of the amount of iron in the body. It is not appreciated ordinarily that the blood contains iron in relatively high proportions compared with the other tissues of the body. Many names have tended to obscure the close etiological relationship of the various types of anæmia due to iron deficiency. The basic mechanisms for the origin of these anæmias are an inadequate intake of iron for the needs of the individual, faulty absorption or utilization of the iron, and loss of this element by bleeding or from transfer to the fetus. Davidson, Fullerton and Campbell[1] have demonstrated in their series that the iron content of the diet was frequently well below the optimal figure, and they conclude that the physiological demands for iron conditioned by pregnancy and menstruation are not satisfactorily supplied by the diet of many women of the poorer classes. These authors have preferred therefore the term "nutritional iron deficiency anæmia" for this disease syndrome.

The answer as to why iron deficiency anæmia is much more common in women than in men of the same social class is to be found largely in the fact that under ideal circumstances women require for health up to the age of the menopause about four times as much iron as men. Although there are other factors than iron which can influence the production of hæmoglobin, iron can cure many cases of hypochromic anæmia. Minot[8] points out that the important point in therapy is to administer enough of a given kind of iron rather than to debate on what is the smallest dose of iron in some particular form that gives the maximal effect.

From the experience gained in the present study it is felt that the more frequent use of the simple procedure of hæmoglobin estimation in private and group health examinations will reveal many instances of adults supposedly in good health but actually suffering from varying degrees of idiopathic hypochromic anæmia. This is probably more specifically termed "nutritional iron deficiency anæmia". The establishment of an early diagnosis, followed by proper treatment, will prevent many cases of severe anæmia.

SUMMARY

1. Of 1,451 parous adult women of the childbearing age 627 (43.2 per cent) exhibited various degrees of anæmia.

2. There was no significant correlation between the incidence of anæmia and the number of pregnancies, the history of profuse menstruation or uterine hæmorrhages, or the interval between pregnancies.

3. The routine use of hæmoglobin estimation is advocated as a case-finding procedure in all health examinations.

This study was made by the Child Welfare Association of Montreal. The Association wishes to acknowledge the very important help given by the Actuarial Department of the Sun Life Assurance Company of Canada. The Association expresses its appreciation to the Charles E. Frosst & Co., Montreal, for their very liberal donation of Ferro-Catalytic capsules which were used in the treatment of the anæmic persons.

REFERENCES

1. DAVIDSON, L. S. P., FULLERTON, H. W. AND CAMPBELL, R. M.: Nutritional iron-deficiency anæmia, *Brit. M. J.*, 1935, 2: 195.
2. HEATH, C. W. AND PATEK, A. J.: *Medicine*, 1937, 16: 267.
3. HEATH, C. W. AND CRANE, M. P.: (Unpublished observations).
4. MACKAY, H. H. M.: The hæmoglobin level among London mothers of the hospital class and its probable bearing on susceptibility to infection, *The Lancet*, 1935, 1: 1431.
5. *Idem*: Nutritional anæmia in infancy, *J. Am. M. Ass.*, 1932, 98: 651 ("Foreign Letters").
6. FULLERTON, H. W.: Anæmia in poor class women with special reference to pregnancy and menstruation, *Brit. M. J.*, 1936, 2: 523.
7. STRAUSS, M. B. AND CASTLE, W. B.: Studies of anæmia in pregnancy. I., *Am. J. M. Sc.*, 1932, 184: 655; *idem*: II., *Am. J. M. Sc.*, 1932, 184: 663; *idem*: III., *Am. J. M. Sc.*, 1933, 185: 539.
8. MINOT, G. R.: Anæmia and the gastro-intestinal tract. A synopsis, *Am. J. Digest. Dis. & Nutrit.*, 1936, 3: 643.

A STUDY OF FIVE HUNDRED CONSECUTIVE CASES OF PRE-ECLAMPSIA*

BY FREDERICK C. IRVING, M.D., F.A.C.S.

Boston, Mass.

THE object of this paper is to review in an unselected group of clinic cases the results of a definite and uniform policy of treatment. For this purpose were chosen the pre-eclamptic registered patients delivered in the Boston Lying-in Hospital between April 21, 1935, and January 1, 1937. Of these 500 patients 397, or 79.4 per cent, were classified as having a mild type of pre-eclampsia; that is, hypertension of moderate degree with no more than a slight trace of albumin in the urine. The other 103, or 20.6 per cent, were of the severe type, having marked or increasing hypertension and albuminuria. Included in the entire group were 16 cases which were considered as primarily hypertensive since they exhibited marked and persistent elevation of blood pressure with little if any albuminuria and no evidences of renal failure. Three patients were diagnosed as nephritics, as they presented signs of diminished kidney function persisting over a long period. The patients were equally divided into 252 primiparæ and 248 multiparæ. Seventy of the multiparæ, or 27.8 per cent, had had pre-eclampsia in a previous pregnancy. There were 16 pairs of twins, a frequency of 1 in 31.2, as contrasted with the normal expectancy of 1 in 87. Eight of the 500 pre-eclamptic patients, or 1.6 per cent, developed premature separation of the placenta. In view of the recognized relationship between these two conditions this low incidence is both surprising and gratifying.

Table I shows the frequency of the leading signs and symptoms. It will be noted that 7 of every 10 pre-eclamptics developed œdema. It was also found that the average gain in weight was 0.74 of a pound per week for the period of observation, as compared with the average gain of 0.5 of a pound generally accepted for the normal woman in pregnancy.

TABLE I.

SIGNS AND SYMPTOMS

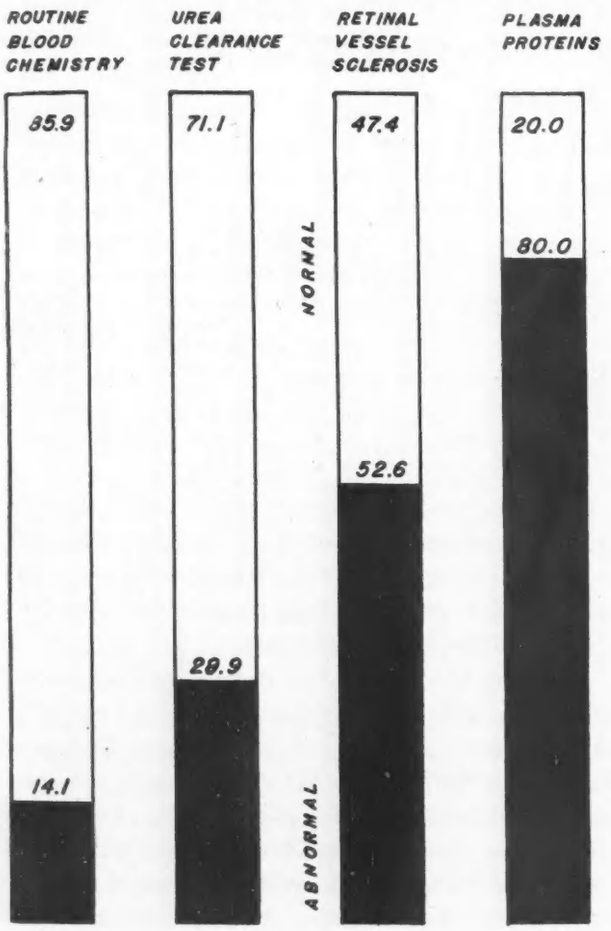
	Number	*Percentage*
Œdema	358	71.6
Headache	209	41.8
Vomiting	137	27.4
Visual disturbances	135	27.0

Routine blood chemical determinations were made in 452 cases. Chart 1 shows that abnormal findings were obtained in only 14.1 per cent, thus indicating that considerable laboratory work was wasted in this type of case. Our experience suggests that the urea and uric acid content of the blood is seldom elevated unless the non-protein nitrogen exceeds the normal limits, and that the determination of even this factor is seldom necessary unless there is reason to suspect impairment of kidney function. A similar statement may be made regarding the urea-clearance test. This test was performed in only 38 cases where restricted kidney function was suspected and showed a diminished clearance in 28.9 per cent. On the other hand, ophthalmoscopic examination of the eye grounds revealed sclerosis of the retinal vessels to some degree in 52.6 per cent. This condition was found in 73.3 per cent of the severe pre-eclamptics examined and in 39.1 per cent of those of mild degree. The special examination was made by our Assistant Ophthalmologist, Dr. W. R. Beetham, in 190 cases. The results indicate the close relationship between pre-eclampsia and the vascular system.[1]

* From the Department of Obstetrics, Harvard Medical School and the Boston Lying-in Hospital.

Read at the Sixty-ninth Annual Meeting, Canadian Medical Association, June 24, 1938.

Determination of the plasma proteins in 25 cases with marked albuminuria and œdema, but with slight hypertension, showed that they were diminished below the normal standard for pregnancy in 80 per cent. This important finding has led us to measure the protein fraction of the plasma as a routine in pre-eclamptics.



PER CENT RELATIVE FREQUENCY OF ABNORMAL FINDINGS IN LABORATORY TESTS AND SPECIAL INVESTIGATIONS

Chart 1

There is a possibility that the results of such investigations may be correlated with the degree of severity of the disease, and, in particular, with the amount of œdema as indicated by an excessive gain in weight.

The general principles of treatment in the 500 cases were substantially uniform. Patients with a systolic blood pressure of 150 or more or a diastolic pressure over 100 were admitted to the hospital and put to bed. The fluid intake and output was measured daily, and the patient was given each day less fluid than she excreted the day before. For the first day the diet consisted of milk to the amount of 1,230 c.c., or 800 calories, which was reduced for the next day or two to keep below the fluid output. A change was then made to a low-salt, low-protein diet, which contained 0.68 g. of sodium chloride, 28 g. of protein, and amounted to 1,378 calories. Since considerable albumin is lost in the urine and the generally lowered plasma proteins indicate a diminished osmotic pressure in the blood stream, tending toward the formation of tissue œdema, it is doubtful if restriction of protein in the diet is a logical measure. We now believe that we may give our patients a diet in which the protein is increased, provided that in so doing we do not unduly elevate the salt content. The kidney lesion in eclampsia is primarily of a vascular nature, being an arteriolar spasm of the afferent vessels of the tubules. It is neither degenerative nor inflammatory, and there can be no valid reason for restricting proteins, which are leaving the body in the urine often in considerable amounts.

Magnesium sulphate was given by mouth at the beginning in half ounce doses every hour to the point of free, watery catharsis. Once established, frequent daily evacuations were maintained by a reduced dosage. Results thus obtained in the reduction of œdema were striking. A number of patients showed a loss of weight from 5 to 10 pounds in a few days.

The usual effect of such a regimen has been a prompt fall in blood pressure. In few cases, however, has albumin completely disappeared from the urine until delivery. Patients showing marked improvement have been allowed to go home under constant supervision by the outpatient staff, to be readmitted if there should be a recrudescence of the condition. Others have been kept in the hospital until the spontaneous onset of labour. If the patient's condition became worse or, if serious, failed to improve, pregnancy has been terminated artificially. If possible we have delayed this event until the thirty-sixth week, because we have believed the viability of the fetus to be increased by such a postponement.

Table II shows the duration of pregnancy when labour, either spontaneous or artificial, took place. In the same table is shown the total fetal mortality, that is, stillbirths and deaths in the first two weeks of life for each four week period. It will be seen that the fetal mortality

TABLE II.
DURATION OF PREGNANCY AT DELIVERY

Weeks pregnant	*Cases*	*Percentage*	*Fetal mortality*	*Percentage*
20-24.....	2	0.4	2	100.0
24-28.....	5	1.0	2	40.0
28-32.....	31	6.2	12	38.7
32-36.....	194	38.8	5	2.6
36-40.....	252	50.4	13	5.9
40.....	16	3.2	2	12.5

in the eighth lunar month of pregnancy was half that in the ninth month, and that the few infants which were post-mature exhibited a very high death rate. We have been unable to correlate this fact with any gross changes in the placenta. It is our opinion that infarction is no more frequent in the placentæ of pre-eclamptics than in those of normal women. It is apparent, however, that prolonged pre-eclampsia is injurious to the fetus *in utero,* although we are ignorant of the mechanism by which this effect is produced. It is possible, however, that the investigations of Tenney[2] at the Boston City Hospital may throw some light on this question. He found in the placentæ of pre-eclamptics and eclamptics a noteworthy degree of degeneration of the syncytial covering of the chorionic villi. This dengeration was more marked in the later weeks of pregnancy. Since the villi are bathed in the maternal blood and all oxygen and nutritious material must pass through the syncytial covering to reach the fetus, and all waste products must also pass through it in the opposite direction, damage to this cell layer may well result in the impaired vitality of the infant *in utero.*

TABLE III.
ARTIFICIAL TERMINATION OF PREGNANCY

	Cases	*Percentage*
Artificial rupture of the membranes.	107	21.4
Pituitary extract.....	43	8.6
Cæsarean section.....	40	8.0
Voorhees bag.....	7	1.4
	197	39.4

Table III indicates that pregnancy was artificially interrupted in 197, or 39.4 per cent of cases. It also shows that our choice has been for conservative measures, since simple rupture of the membranes or the administration of pituitary extract in 1 to 4 minims doses was employed in 150 of 197 cases. Until some more direct therapeutic attack upon pre-eclampsia is discovered it is our firm belief that the artificial termination of pregnancy in cases which do not improve or which grow worse is our strongest weapon in the prevention of convulsions. Although 40 Cæsarean sections were performed, in only 8 was the reason primarily pre-eclampsia. In the remaining 32 the indications were contracted pelvis or cephalo-pelvic disproportion 17, inertia 5, heart disease 2, a previous Cæsarean section 2, and miscellaneous indications such as compound presentation, rupture of the uterus, placenta prævia, premature separation of the placenta, repaired vesico-vaginal fistula and osteitis fibrosa cystica, 1 each.

TABLE IV.
METHODS OF DELIVERY
(516 infants, including 16 pairs of twins)

Normal vertex.....	333	90.3 per cent
Low-forceps.....	109	
Breech.....	24	
Mid-forceps.....	5	
High-forceps.....	1	
Version.....	3	
Cæsarean section.....	41	

Table IV shows the methods of delivery of the 516 infants. Again a trend is shown toward conservatism, since 90 per cent were delivered normally by low forceps or by the breech.

Of the 500 cases 5, or 1.0 per cent, developed convulsions, in each case following labour or early in the puerperium. There were no antepartum or intrapartum fits. One patient had 1 convulsion, one 2, one 3, and two 4. All responded to magnesium sulphate given intravenously, sedatives, or plasmaphoresis. All 5 women recovered. We may say, therefore, that a pre-eclamptic woman treated in the way I have outlined has one chance in a hundred of developing eclampsia.

One pre-eclamptic patient died of general peritonitis following a lower segment Cæsarean section. This gives a maternal death rate of 0.2 per cent for the series of 500 and a mortality of 2.5 per cent for the 40 Cæsarean sections in this group. The patient who died was a primipara with a contracted pelvis upon whom a Cæsarean section was performed after a trial labour of 24 hours and one vaginal examination. Local anæsthesia was used because the patient had an acute pharyngitis and laryngitis. Routine uterine culture at the time of operation revealed the presence of a non-hæmolytic streptococcus. No deaths occurred among the 460 women delivered through the pelvis. This single catastrophe again points to the danger which always attends Cæsarean

section when performed for any reason, a risk which does not seem generally to be recognized (Table V).

TABLE V.

MATERNAL RESULTS

	Cases	*Percentage*
Developed convulsions (all post-partum; all mild; no deaths)	5	1.00
Discharged alive	499	
Discharged dead (peritonitis following Cæsarean section)	1	0.2

Of the 516 infants, 480, or 93 per cent, left the hospital alive. Thirty, or 5.8 per cent, were non-viable or stillborn, and 6, or 1.2 per cent, died in the first two weeks. The gross fetal mortality was 6.9 per cent. Since the gross fetal mortality of the entire hospital population for the period under study was 6.3 per cent it can be seen that the death rate was increased only 0.6 per cent, in spite of the large proportion of premature deliveries (Table VI).

TABLE VI.

FETAL RESULTS

(516 infants, including 16 pairs of twins)

	Cases	*Percentage*
Discharged alive	480	
Non-viable and stillborn	30	5.8
Discharged dead	6	1.2
Gross fetal mortality	36	6.9

SUMMARY

1. This study is based on 500 cases of pre-eclampsia occurring among registered clinic patients.

2. The medical treatment consisted of admission to the hospital, rest in bed, restricted fluid intake, a diet of restricted salt and protein, and the free use by mouth of magnesium sulphate as a purgative.

3. Pregnancy was terminated artificially in two-fifths of the patients because sufficient improvement did not ensue, and conservative measures were the choice.

4. One per cent of the patients developed convulsions, which were in each instance post-partum in time and mild in nature. No patient with convulsions died.

5. The only fatality occurred in a patient who died of peritonitis following a Cæsarean section.

6. The gross fetal death rate was 6.9 per cent.

REFERENCES

1. IRVING, F. C.: The vascular aspect of eclampsia, *Am. J. Obst. & Gyn.*, 1936, 31: 466.
2. TENNEY, B. JR.: Syncytial degeneration in normal and pathologic placentæ, *Am. J. Obst. & Gyn.*, 1936, 31: 1024.

RHEUMATIC INFECTION IN CHILDHOOD: THE EFFECT OF SURGICAL OPERATIONS ON THE BLOOD SEDIMENTATION RATE*

BY H. L. BACAL AND R. R. STRUTHERS

Montreal

IN previous contributions to this Society the authors have discussed the danger of premature interference with foci of infection in children suffering from various manifestations of rheumatic fever. Such foci of infection are, notoriously, found to be present in the tonsils and adenoids, paranasal sinuses, and the teeth. We have also offered the opinion that such foci should not be treated until all evidence of activity of the rheumatic fever has been absent for a minimum period of six weeks. The criteria we have used in determining the activity of rheumatic fever in children have been the rectal temperature, the sleeping pulse rate, the sedimentation rate, the Schilling shift, the white blood cell count, and the body-weight. Our conclusions may be summarized as follows.[1]

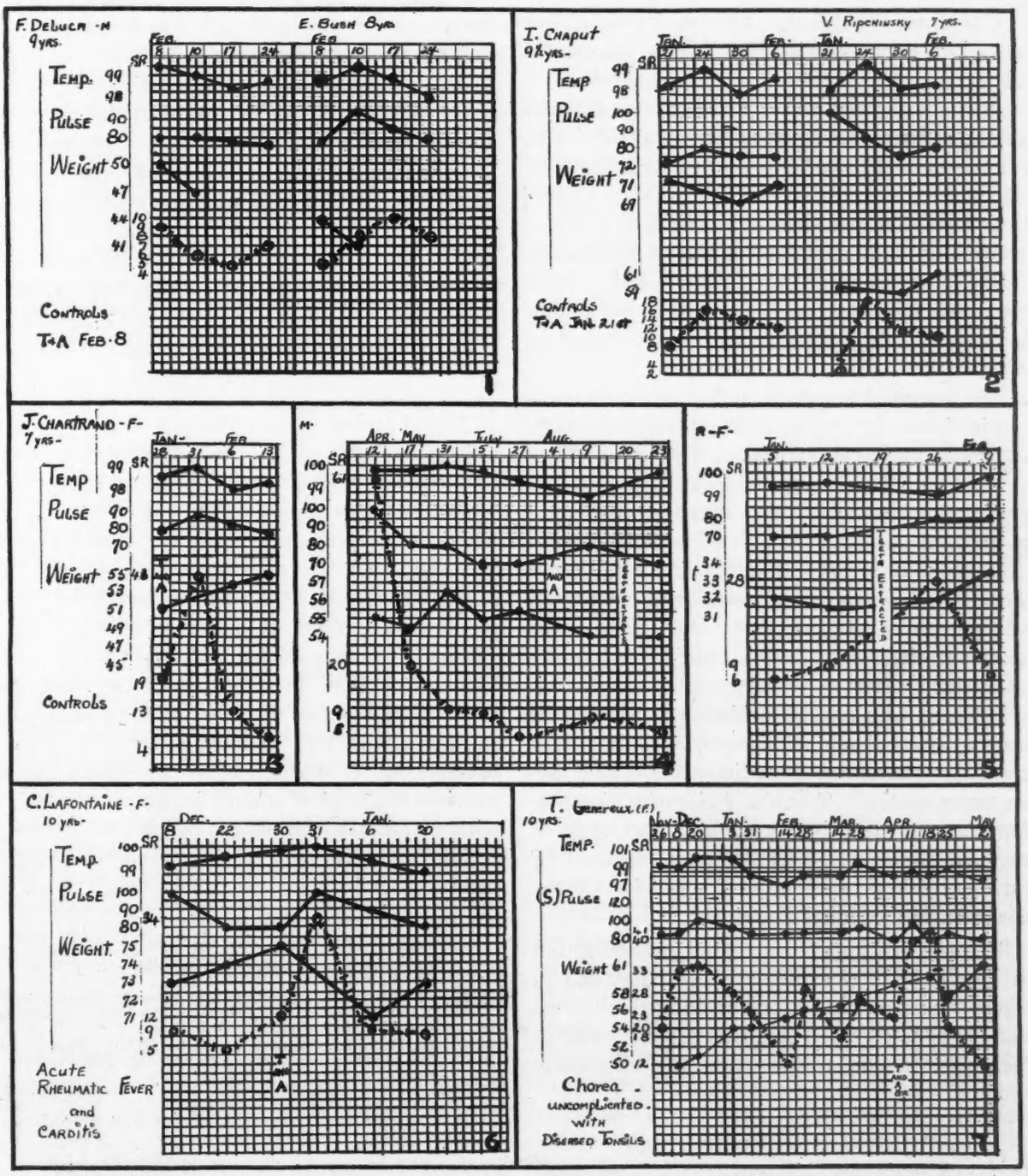
(1) Acute rheumatic fever is a manifestation in which the sedimentation rate falls rapidly from a high level to normal following the subsidence of symptoms. (2) Chorea is a manifestation in which the sedimentation rate is constantly normal, even slightly below normal in the absence of complications. There the disappearance of the clinical manifestations and a gain in weight are signs of inactivity. (3) Carditis is a manifestation in which, with recovery, the sedimentation rate falls slowly during a period of months to a normal level.

* From the "Rheumatism Service" of the Children's Memorial Hospital and the Department of Pædiatrics, McGill University, Montreal.

Presented before the Meeting of the Canadian Society for the Study of Diseases of Children, June 4, 1938, Kingston, Ont.

The present contribution deals with the effect of surgical operations to eradicate foci of infection on the blood sedimentation rate. Before beginning the present study it was our clinical impression that children suffering from rheumatic fever were definitely more serious surgical risks than normal children, that they suffered more frequent post-operative complications, required a longer convalescence, and lost on the average four pounds in weight following, in particular, the removal of tonsils and adenoids.

To establish comparable observations 50 children presenting themselves to the Out-Patient Department for tonsillectomy were observed as controls. In none of these children was a history of rheumatic fever elicited; likewise none of them gave a family history of rheumatic infection. Observations on the sedimentation rate in these children were made



In all charts the top solid line represents the rectal temperature; the second—the sleeping pulse rate; the third—the body weight; the broken line—the sedimentation rate at the end of the first hour.

immediately before operation, two days after operation, at the end of one week, and the end of two weeks. Similarly, their weights were recorded before operation, two days after operation, and at the end of one week and two weeks following operation. In this group of *normal children* there were apparently three types of response.

1. Some children showed no alteration in sedimentation rate or loss of weight after operation. Chart 1.

The normal readings are 5 to 8 mm. in one hour and values over 12 mm. can be considered abnormal. For method see reference No. 2.

2. Some showed a sharp rise and sudden fall of the sedimentation rate after operation, with an average loss of weight of two pounds. Chart 2.

3. Some few children who before operation showed a slight elevation of the sedimentation rate showed an immediate fall to normal within the week following operation and a continuing normal rate thereafter following the period of observation. Chart 3.

One hundred children suffering from rheumatic fever or its manifestations etc. were observed in the Rheumatism Pavilion.[3] They showed reactions comparable on the whole to those of normal children. Three groups could be recognized.

1. Those children with acute rheumatic fever who had no evidence of activity as shown by normal sedimentation rate, etc., and whose sedimentation rates were not affected by operation. Chart 4.

2. Those who had no evidence of activity as shown by sedimentation rate, etc., but who showed a sharp rise of sedimentation rate following operation. This sharp rise of sedimentation rate apparently may follow any type of surgical procedure, tonsillectomy, removal of carious teeth, or surgical drainage of the paranasal sinuses. Charts 5 and 6.

3. Those in whom the elevated sedimentation rate was the only evidence of activity, and in whom we concluded after prolonged observation that the elevated rate was probably due to foci of infection rather than the rheumatic fever, and who showed, as did some of the normal controls, a sudden and sharp drop to normal. In these children the sedimentation rate remained within normal levels thereafter during the period of observation. Chart 7.

The clinical impression concerning the loss of weight in rheumatic children following surgical interference was confirmed, namely, that the loss of weight is greater than in normal children, averaging in these hundred cases slightly more than three pounds, with the maximum of six and the minimum loss of one pound; also the greater frequency of post-operative complications such as hæmorrhage, cervical adenitis, was substantiated. Comparing the children suffering from rheumatic fever with the non-rheumatic controls as regards the effect on the sedimentation rate of surgical operations, the clinical impression that the former are not such good operable risks, as shown by the frequency of protracted convalescence and the occasionally marked loss in weight, is confirmed.

CONCLUSION

The rheumatic child usually shows a more marked alteration in the sedimentation rate and loss of weight following surgical operations than does the normal non-rheumatic child. This difference is not, however, as striking as we had been led to expect by our clinical observations. It may also be concluded that, infrequently, when the increased sedimentation rate is the only evidence of activity of a rheumatic infection in childhood, the surgical removal of the foci of infection may cause the falling of the rate to normal with the maintenance of a normal rate thereafter. The surgical removal of foci of infection in a child with rheumatic disease is a definitely more serious undertaking than in the non-rheumatic child.

REFERENCES

1. STRUTHERS, R. R. AND BACAL, H. L.: Determination of the activity of rheumatic infection in childhood, *Canad. M. Ass. J.*, 1933, 29: 470.
2. *Idem*: Rheumatic infection in childhood: observations on the sedimentation rate and the Schilling count, *Canad. M. Ass. J.*, 1936, 35: 258.
3. BACAL, H. L. AND STRUTHERS, R. R.: The organization of a rheumatism service, *Canad. M. Ass. J.*, 1938, 38: 227.

A COMPARISON OF ETHER, SPINAL, AND CYCLOPROPANE ANÆSTHESIA*

BY J. C. HOUSTON, M.D., F.I.C.A.

Charlottetown, P.E.I.

AT the Prince Edward Island Hospital we are using ether, cyclopropane and spinal anæsthesia in about the same number of operations. Looking over the records, I found that up to and including the year 1933 we were using ether almost exclusively; in 1934 we began to use spinal anæsthesia regularly; and in November, 1936, we started using cyclopropane.

This is the record for the past six years.

	Ether	*Spinal anæsthesia*	*Cyclo-propane*	
1933.....	90%	5 cases	nil	The remainder received chloroform, nitrous oxide with oxygen, and local anæsthesia.
1934.....	60%	35%	nil	
1935.....	80%	15%	nil	
1936 to Nov. 1936	70%	25%	nil	
Nov. & Dec.	40%	25%	30%	
1937.....	40%	20%	35%	
1938 to date	40%	10%	45%	

You can see what may happen in the course of a morning's work in the operating room, *viz.*, that the first operation may be under ether, the next under spinal anæsthesia and the next under cyclopropane. This actually does occur on many days. When asked to prepare a paper for this meeting I decided to give you something on the results we are having with these three anæsthetic agents, and try and arrive at an estimate of the relative value of each.

In order to make a comparison of their respective values I have adopted a scheme of measurement—a yardstick it has been called—with ten sections or headings, and I am allotting so many points to each under the various headings something after the manner of judges at our shows when they grade the article by the number of points scored in a particular class.

1. *Safety.*—We will all agree that safety is one of the prime requisites of an ideal anæsthetic. We might go farther and say it is the first essential element. How shall we judge safety? I find the usual criterion is the number of deaths during the operation, which is hardly fair. For instance, if the patient "bled to death" during the operation you should never charge that to the anæsthetic. Nevertheless it is always easy to attribute to the anæsthetic or to its mode of administration any unusual complications which cannot be accounted for otherwise. I think we should take into consideration the condition of the patient prior to the operation, the time taken to perform the operation, the nature of the operation, and also the difficulties encountered during the operation in order to keep the patient within the safety-zone.

Ether has always been regarded as a very safe anæsthetic, if not the safest of all. On the other hand there is a great diversity of opinion as to the safety of spinal anæsthesia. Some say it is safer than ether, while others assert that it is more dangerous than chloroform. Cyclopropane, being one of the newer anæsthetics, has yet to make its reputation.

We had one death on the operating table while administering ether. The patient, a woman, was apparently a first-class risk; the heart, lungs, kidneys were normal as shown by chart. Five minutes after the operation started she suddenly went bad. The pulse became weak, the respirations feeble, and in spite of everything we could do she died. Evidently the death was due to the anæsthetic. No post-mortem was done. Our greatest difficulty with ether is to maintain normal respiration, and I have a feeling that this has increased since we began heavier premedication, especially if avertin has been given and to a less extent after nembutal. The respirations become feeble and may stop, requiring artificial respiration, which is rather awkward for the surgeon and embarrassing to the anæsthetist. It seems to require less ether to paralyze the respiratory centre, and it is therefore necessary to watch the breathing very closely. We have less trouble with the circulatory system, and I think this is largely due to our routine practice of giving intravenous saline and glucose in all operations that we think may continue for an hour or more. We do this regardless of the anæsthetic employed and in all cases where the patient is considered a poor risk.

* Read at the Sixty-ninth Annual Meeting of the Canadian Medical Association, Section of Anæsthesia, June 22, 1938.

Although we have had no deaths under spinal anæsthesia we did have several cases which gave us some very anxious moments. I will never forget one case—I would say he was a good half-way "across the Jordan", and it required twenty minutes hard coaxing with artificial respiration, oxygen, and stimulants to bring him back to this side. In about 10 per cent of the cases under spinal anæsthesia we experience some minor troubles, such as lowering of blood pressure, distressed respirations, and some nausea, but I have learned during the past year that a little cyclopropane will relieve these conditions, so that our worries seem to be decreasing from year to year. In fact, there are many cases in which we never take the blood pressure. This however, can be said, that the higher the anæsthesia, the more difficulties are encountered; in other words the higher the anæsthesia, the greater the danger.

We have been singularly free from worry and anxiety with cyclopropane, but not altogether. That is perhaps too much to expect. The breathing is very quiet under this gas; often one must watch the bag to know whether the patient is breathing or not. This, in itself, is rather disconcerting, especially to one accustomed to giving ether. Notwithstanding this, I feel more at ease with a patient under cyclopropane than under ether or spinal anæsthesia. Value: ether 90; spinal anæsthesia 80; cyclopropane 95.

2. *Potency.*—The ability to abolish pain and spasm is another essential requisite of the ideal anæsthetic. All three will abolish pain, but they vary in their power to control spasm. There is always perfect relaxation under spinal anæsthesia. It is sometimes necessary to push ether beyond the safety-zone in order to produce the relaxation some surgeons desire. Cyclopropane does not give adequate relaxation in 50 per cent of cases in our experience. Value: ether 90; spinal anæsthesia 100; cyclopropane 50.

3. *Control.*—Ether and cyclopropane, being volatile anæsthetics, are comparatively easy to control; cyclopropane being more volatile than ether is therefore the more controlable. The patient is anæsthetized in less time with cyclopropane and regains consciousness quicker. In spinal anæsthesia if the anæsthetic effects have reached too high a level, causing embarrassment of the respiration, there is no means of control, one has only to wait until the effects of the drug have passed off, and in the meantime combat the symptoms as they arise with artificial respiration, oxygen, and stimulants. However, there are three means by which the height of the anæsthesia can be controlled, 1st, by posture; 2nd, by the interspace where the spinal is given; and, 3rd, by the amount of fluid given with the drug. We always use the third interspace if possible. After nupercain is given I raise the head of the table about 20 degrees and lower the feet. Then I watch very carefully the anæsthesia as it creeps upwards; when it reaches the desired height I reverse the table. With novocain the technique is just the opposite, but the head is seldom lowered more than 10 degrees. I feel that this is the most important measure of the three. We may be "fooling ourselves" in so thinking, but this much I am sure of, *viz.*, that the time required to reach a certain level, be it umbilicus or ensiform cartilage, varies considerably in almost every case. Sometimes the desired level is reached in 2 minutes and again it may be 10 or 12 minutes before it even reaches the umbilicus, so that if one should keep strictly to a certain time limit the level of anæsthesia would sometimes be too low, at other times too high. Values: ether 90; spinal anæsthesia 50; cyclopropane 100.

4. *Toxicity.*—I have included toxicity in the yardstick because I feel it is an essential requisite of an ideal anæsthetic. I mean by toxicity the toxic effects on the different organs, not the effects of overdoses or maladministration. The use of chloroform has been largely banned because of its toxicity.

I realize I am not capable of placing a value in this section on the anæsthetic agents under consideration, but from my reading of articles by Anderson, Bourne, Raginsky and others I would say we need not worry over the toxic effects of any of them. However, if I had a patient with damaged heart or faulty function of the liver or kidneys I would feel safer with cyclopropane than with ether or spinal anæsthesia. Value: ether 90; spinal anæsthesia 90; cyclopropane 100. The remaining sections of the yardstick can hardly be regarded as primary requisites of an ideal anæsthetic. Nevertheless they are more or less important.

5. *Comfort.*—It is under this heading that cyclopropane far surpasses ether and spinal anæsthesia. With it the patient falls into a natural sleep in one to two minutes and is ready for the operation in four to six minutes. There

is no excitement, no struggling, no rigidity—all is peace and quietness.

Ether, on the other hand, is not an agreeable anæsthetic, either from the patient's standpoint or that of the anæsthetist. There is always more or less excitement and rigidity, with a tendency to nausea and vomiting. I know the textbooks say that these can be largely avoided if ether is properly administered. I have seen a large number of doctors and nurses give ether in many of the larger as well as smaller hospitals and the irritation of the ether has always a tendency to produce spasm with its consequent discomfort.

With spinal anæsthesia there is a certain amount of discomfort. It is never a pleasant sensation to get a jab in the back even if it is only from a hypodermic needle. Then also it is sometimes necessary to make several attempts at different angles in order to reach the spinal canal. After the anæsthetic is given the patient often complains of a disagreeable sensation in his legs. "If I could only move my legs" is a common expression. Values: ether 50; spinal anæsthesia 75; cyclopropane 100.

6. *Complications.*—The nausea and vomiting following ether anæsthesia are the two factors that have made people dread an anæsthetic perhaps more than any other. They are unconscious to a large extent of the distress during induction, but they never forget the ether sickness following the operation. An anæsthetic which would banish all the distressing sequels of an operation would be a welcome addition to the armamentarium of the anæsthetist. Whether we have such an agent in cyclopropane it is perhaps too soon to say, but this much is certain, that with it nausea, vomiting, distension, gas-pains, and even pneumonia are not met with so often as with ether. Another thing I have noticed is that there is never the excessive perspiration which we often see with ether. With spinal anæsthesia there is less vomiting than after ether, but, strange as it may seem, there appears to be as much pneumonia following spinal anæsthesia as after ether. There is, however, one rather serious complication which we have had after spinal anæsthesia, and that is severe headache. One patient had a very distressing headache for almost six months. Two others had severe headache, but it did not continue so long, while quite a large percentage suffer from headache for several days. Value: ether 50; spinal anæsthesia 60; cyclopropane 95.

7. *Simplicity of administration.*—One would never think of asking a layman or a midwife to give cyclopropane or a spinal anæsthetic, and I suppose all of us who have had any experience in country practice have requested midwives and laymen to give ether and chloroform for us time and time again. Therefore it would appear that ether is much simpler to administer than cyclopropane or spinal anæsthesia. On the other hand, it does not require much training to be able to give cyclopropane, especially if one is accustomed to giving nitrous oxide or ethylene. In my own case I had the good fortune to be in Montreal when Dr. Harold Griffith commenced using this gas at the Homœopathic Hospital. I spent a week with him at that time. I came home enthusiastic over the new anæsthetic, but it was a year later before I began to use it at our hospital, after spending another week with Dr. Griffith. That was the extent of my training with cyclopropane. Now I would rather give it than any other anæsthetic.

The technique of spinal anæsthesia appears simple, but it is not always so easy as it looks. We had four cases in which we failed to get the needle into the spinal canal, and had to revert to ether. Value: ether 100; spinal anæsthesia 90; cyclopropane 95.

8. *Scope of usefulness.*—We have never attempted to use spinal anæsthesia for any operation above the level of the diaphragm. Ether has been used in every conceivable type of operation. It cannot be employed in operations about the head and neck when cauterization is required. Cyclopropane can be used for any operation where ether can be used and has the same limitations on account of its explosiveness. Just here I might say that we do not take any extra precautions in our hospital on account of the explosive nature of cyclopropane. Our operating room is partially air-conditioned, and we can change the air in it every 10 or 15 minutes if necessary. Values: ether 90; spinal anæsthesia 50; cyclopropane 90.

9. *Popularity.*—The popularity of any agent is not a very dependable criterion of its value in this day of high pressure salesmanship. I think we can better gauge the value of an anæsthetic by the way it is received by surgeons and anæsthetists. In our hospital cyclopropane has replaced ether and spinal anæsthesia in about 50 per cent of the operations, and the same ratio

is seen in other hospitals where it is used. In the Homœopathic Hospital, Montreal, cyclopropane is used almost exclusively, and I saw a report of the Lahey Clinic some months ago to the effect that cyclopropane was given in 13.3 per cent of all operations in 1934, 34 per cent in 1935, and 54.5 per cent in 1936. Value: ether 50, spinal anæsthesia 50; cyclopropane 100.

10. *Cost.*—This, of course, has nothing to do with the efficiency value of the anæsthetic, but from the trustees' standpoint it is a rather important factor. In our hospital the cost per patient for ether was 55 cents, spinal anæsthesia varied from 40 to 75 cents, while the cost of cyclopropane per patient was $1.00, not including the oxygen. Value: ether 100, spinal anæsthesia 100, cyclopropane 50.

What is the result of our analysis of the merits of each?

	Ether	*Spinal anæsthesia*	*Cyclopropane*
1. Safety	90	80	95
2. Potency	90	100	50
3. Control	90	50	100
4. Toxicity	90	90	100
5. Comfort	50	75	100
6. Complications	50	75	90
7. Simplicity of administration	100	90	95
8. Scope of usefulness	90	50	90
9. Popularity	50	50	100
10. Cost	100	100	50
	800	760	870

This shows that each has its good points while none can be regarded as the ideal anæsthetic in all respects. Cyclopropane heads the list, and I think deservedly so. I believe that the hospital that has not provided its anæsthetist with the facilities to administer cyclopropane is not giving its patients all the benefits of the advances made in anæsthesia in the past five years.

In conclusion, I would like to express my appreciation of the values of these anæsthetics in a more personal way. If I should be so unfortunate as to require an abdominal operation at any time I would wish to be given a spinal anæsthetic, for I feel that the surgeon would then be working under the most ideal conditions, and this, I believe, would far outweigh any risks occasioned by this method of anæsthesia. However, I would make the proviso that if I should become "seasick" during the operation, when the surgeon begins to explore I would want a little cyclopropane to ease the discomfort. If I should ever require a rib-resection or a thoracoplasty I certainly would demand cyclopropane; if a thyroidectomy, I would like the surgeon to commence under local anæsthesia and if things became disagreeably painful when working in the deeper structures I would want some cyclopropane added; and if I should ever require to have my tonsils removed I would wish to have cyclopropane by the intratracheal method. So you see I am pretty much "sold" to cyclopropane.

OTITIS MEDIA FROM THE PÆDIATRICIAN'S VIEWPOINT*

BY GEORGE A. CAMPBELL, B.A., M.B., F.R.C.P.(C)

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THIS disease in infancy demands the closest cooperation between otologist and pædiatrician.[1] As Duel[2] has said, "The otologist who operates on an infant with otitis needs the pædiatrist to help in the subsequent care just as much as the pædiatrist needs him (the otologist) to do the operating". Otitis media is usually ushered in with pædiatric rather than otologic symptoms; a painful cough, diarrhœa, anorexia or loss of weight suggests to the mother the need of a pædiatrist rather than an otologist. The diagnosis having been made, the primary decision as to whether myringotomy should be performed rests with the pædiatrist. One often hears otologists say that it never does any harm to open an ear drum, that all inflamed ear drums should be opened. Let me quote the opinion of Kopetzky[3], discussing the surgical treatment of streptococcal otitis, "As a result of long observation it has become evident that to incise the drum too early in the course of the development of an acute suppuration of the middle ear is to add a factor toward the promotion rather than toward the retardation of the middle ear infection".

* Read at the Sixty-Ninth Annual Meeting of the Canadian Medical Association, Section of Pædiatrics, Halifax, June 22, 1938.

For many years I have been in the habit of prescribing 5 per cent phenol and 5 per cent cocaine in glycerin as ear drops with warm irrigations, using a return-flow glass ear douche and a mild astringent nasal jelly. More recently I have used chloretone and ephedrine ear drops, according to this formula. Chloretone grs. $\bar{ii}$; Ephedrine sulphate grs. $\bar{ii}$; Glycerin; Distilled water $\overline{aa}$ oz. $\bar{ss}$. Sig. 3 drops in ear q.1.h. till relieved, then q.6.h., as recommended by J. A. Johnston, of the Henry Ford Hospital, Detroit. This local medication is preferable to phenol and cocaine in glycerin because it relieves the pain as well or better and can be used for longer periods without causing desquamation of the canal and obliteration of the landmarks of the drum. If at the end of twenty-four or at the most forty-eight hours the otitis does not show very definite signs of subsidence it is our duty to call in an otologist who is competent to perform the operations incident to all the possible complications of otitis including mastoiditis, sinus thrombosis, brain abscess and so forth.

It should not be forgotten that otitis media may occur in the new-born. Sidney Owen performed a myringotomy on a twenty-four hour old infant whose temperature was 103° F. and found pus.

THE USE OF SULPHANILAMIDE IN OTITIS MEDIA

Sulphanilamide has been shown to be bacteriostatic for streptococci, meningococci, colon bacilli, certain staphylococci, and, possibly, *H. influenzæ*. These organisms are responsible for 53 per cent of all cases of otitis according to Ebbs.[5]

TABLE I.

THE INCIDENCE OF VARIOUS ORGANISMS FOUND IN 200 CASES OF OTITIS MEDIA

		Percentage
Total number of organism found ..	275	
Streptococcus	139	50.5
Pneumococcus	49	17.8
Staphylococcus aureus	35	12.7
Staphylococcus albus	24	8.7
H. influenzæ (Pfeiffer)	15	5.4
Meningococcus	4	1.4
Micrococcus catarrhalis	3	1.0
B. coli	3	1.0
Tubercle bacilli	2	0.9
Diphtheria bacillus	1	0.3

On October 25, 1936, I was asked to see the ten-year old son of a physician suffering from double mastoiditis complicating scarlet fever. A continuous fever, ranging from 103 to 106° F., had persisted for forty-four days. Four hours after his first dose of sulphanilamide (prontylin*) his temperature became normal and remained normal. One week later he had returned home with his mastoid cavities entirely dry. I believe this was the first time sulphanilamide was used in Canada.

At the onset of every case of otitis media sulphanilamide should be given in full doses for two days and (what is equally important) in reduced doses for four or five days longer because sulphanilamide is only bacteriostatic and must be given until the natural immunological forces of the body have had time to mobilize. In my service it has been frequently observed that when ear-drums are opened after pre-medication with sulphanilamide there is little or no discharge and the paracentesis opening heals within two or three days. The dosage we have used is as follows: Initial dose, ½ grain per pound followed by ¼ grain per pound every 6 hours for 48 hours, then ⅛ grain per pound every 6 hours for 4 or 5 days unless a clinical cure occurs before this time.

An attempt should be made to obtain a sulphanilamide blood concentration level of 4 mg. per cent within forty-eight hour. Toxic symptoms such as methæmoglobinæmia, sulphæmoglobinæmia, are rare and easily and quickly relieved by blood transfusion. Sulphanilamide is compatible with the aspirin series, the barbituric series and the amidopyrines, but definitely incompatible with the saline laxatives.

At the Ottawa General Hospital (Children's Division) in the case of acute profusely discharging ears, the average duration of hospitalization in 73 cases during the winter 1936 and 1937, October to May, was 24.15 days with 8.2 per cent complications. During the winter of 1937 and 1938, October to May, with the routine use of sulphanilamide, the number of cases was reduced to 49, the average duration of hospitalization to 8.07 days, the incidence of complications to 4.1 per cent.

LATENT MASTOIDITIS

Although the association between intestinal disturbances and otitis media was noted by Hartmann in 1894 and Ponfick in 1897 it remained for Marriott to show that latent mastoid-

* This material was not then commercially available in Canada and was sent up from New York by plane through the courtesy of the Winthrop Chemical Company.

itis was a common cause of fatal athrepsia. In 1927 he stated that he had found mastoid infection in over 75 per cent of severe nutritional disturbances coming to his clinic. Improvement followed regularly after post-auricular drainage.

Odeneal performed autopsies on 300 infants dying of malnutrition and found pus in the mastoid antrum in 80 per cent. Schwartz[4] asserts that 90 per cent of nutritional disturbances in infants primarily have nothing to do with the intestinal tract. In a study of 880 autopsies on children varying in age from birth to fourteen years dying in hospital, Ebbs[5] found pus in the mastoids in 52.8 per cent; 70 per cent of these cases were in infants.

The importance of this combination of diseases was impressed upon me in the fall of 1932, when at three consecutive autopsies pus was found in both mastoid antra of three infants who during life were thought to be suffering from simple marasmus, and in whom mastoiditis had not been suspected. In each of these cases the colon bacillus was recovered in pure culture. Davison[6] has shown that in the course of summer diarrhœa the colon bacillus can migrate from the colon to the small intestine and even the stomach. From here it is easily carried during bouts of vomiting to the Eustachian tube and thence to the middle ear and mastoid antrum. In this type of mastoiditis the usual signs of pain, tenderness and swelling over the mastoid process are conspicuous by their absence. The usual x-ray deviations from normal are absent, and when we request the otologist to perform mastoidectomy and he asks us which side, we usually have to reply, "Do one side first and if pus is not found or the infant does not improve do the other". In my clinic during the past year double mastoidectomy has been performed on 12 athreptic infants with recovery in 11 cases. In 9 of these cases the colon bacillus was isolated in pure culture.

In these cases the weight curve will tell us which course to follow. No matter how profusely the ear is discharging one should simply watch and wait if the infant is gaining. On the other hand, if digestion seems normal and the caloric requirements have been fulfilled but the child fails to gain early antrotomy should be performed, even though the discharge is scant. This procedure which is quite simple in competent hands, provides adequate drainage, and is usually followed by prompt recovery.

A thorough mastoidectomy can be performed on an infant in four minutes and a bilateral mastoidectomy, with removal of adenoids, in eleven minutes. Watson-Williams[5] allows himself "a minute a month", that is for a seven months' infant the operation must be completed in seven minutes from incision to stitches. Le Mee[5] uses instead of anæsthesia an ice-bag applied to the mastoid region for five minutes before the operation.

For chronic discharging ears without mastoiditis the otologists on my service have been disappointed in the results obtained by zinc ionization, and feel that they obtain better results with either a saturated solution of urea or a 5 per cent solution of sulphanilamide dissolved in equal parts of acetone and alcohol; Sulphanilamide grs. $\overline{xxv}$; Alcohol 95 per cent and Acetone $\overline{aa}$ oz. $\overline{ss}$.

PARANASAL SINUSITIS

Campbell[7] believes that purulent otitis media is invariably accompanied by acute purulent sinusitis. He uses a nasal suction bulb to remove excessive secretion and deprecates the use of local nasal antiseptic drops.

THE PREVENTION OF OTITIS MEDIA

Although this aspect has been reserved to the last, the main interest of the pædiatrist in otitis media lies in its prevention.

The prevention of otitis media in hospital practice presents problems which do not exist to the same extent in private practice. In hospital practice, as McKhann and his co-workers have shown[8]: (*a*) 22 per cent of all respiratory infections go on to otitis media; (*b*) 15 per cent of infants in hospital develop secondary illness as the result of cross infection; these secondary illnesses comprise 47 per cent of the total infections in children's wards; (*c*) 90 per cent of these secondary infections occur after two weeks' residence in hospital; (*d*) the incidence is particularly high in patients suffering from malnutrition, congenital malformation, eczema and mental deficiency.

These workers conclude that: (*a*) Adequate masking of all attendants—paper masks, cellophane masks or gauze masks with cotton fillers (the usual gauze mask is inadequate)—should be insisted upon in all children's hospitals. (*b*) An attempt should be made to keep the air in the wards sterile by means of ultra-violet

radiation and suitable air-conditioning. (*c*) Individual and complete cubicle isolation, or, better still, a separate room for each patient with outside ventilation is desirable. (*d*) A minimal period of hospitalization (2 weeks) reduces cross-infection by 90 per cent. (*e*) Infants particularly susceptible to secondary infection should not be placed in the same ward with acutely ill infants.

E. C. Robertson, of the Hospital for Sick Children, Toronto, has shown that by the routine use of Dettol Obstetrical Cream as a hand lotion pathogenic organisms on the hands of nurses and other attendants in children's wards can be practically eliminated without causing any injury to the skin.

In private practice the problem is much simpler. Otitis media does not develop in those patients whose adenoids and tonsils are removed as soon as they begin to cause trouble; where home conditions supply ample means of isolation and where adequate parental control makes it possible to provide sufficient bed rest for children suffering from common head colds, and where parental interest and intelligence permit us to immunize infants against the common contagious diseases at a sufficiently early age.

SUMMARY

1. Otitis media in childhood demands the most complete cooperation between otolaryngologist and pædiatrician.

2. It devolves on the pædiatrist to decide: (*a*) whether otitis media alone explains the whole clinical picture; (*b*) whether surgical intervention is necessary; (*c*) to recommend a competent otologist.

3. The routine use of sulphanilamide both for prophylaxis and treatment has reduced the incidence, duration and complications of otitis.

4. Otitis media is one of the most frequent infections responsible for nutritional disturbances.

5. The importance of latent mastoiditis (colon bacillus) as a common cause of fatal marasmus is stressed; 53 per cent of all children dying in hospital show purulent mastoiditis at autopsy. The decision to perform mastoidectomy in such cases should be decided by the otologist and pædiatrist in conference.

6. Purulent sinusitis, which invariably accompanies otitis media, requires routine conservative treatment.

7. Otitis media in hospitals presents special problems in prevention not found in private practice. In the former, prevention of cross-infection is all important.

REFERENCES

1. CAMPBELL, G. A.: Septicæmia in children, *Canad. M. Ass. J.*, 1931, 24: 674.
2. DUEL, A. B.: *Arch. Pediat.*, 1910, 27: 743.
3. KOPETZKY, S. J.: Otologic Surgery, Paul B. Hoeber, Inc., 1929, p. 60.
4. SCHWARTZ, H.: Relation of diarrhœa in children to otitis media purulenta, *Med. Rec.*, 1922, 101: 86.
5. EBBS, J. H., WATSON-WILLIAMS, E. AND LE MEE: Discussion on otitis media in early childhood, under 5 years, *J. Laryngol. & Otol.*, 1937, 52: 691.
6. DAVISON, W. C.: The Compleat Pediatrician, Duke University Press, 2nd ed., 1938.
7. CAMPBELL, E. H.: Association of acute sinusitis and acute otitis media in infants and in children, *Arch. Otolaryngol.*, 1932, 16: 829.
8. MCKHANN, C. F. *et al.*: Hospital infections, *Am. J. Dis. Child.*, 1938, 55: 579.

THE USE OF UREA AND CAROID IN CHRONIC OTITIS MEDIA*

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UREA as a bactericidal agent has come into prominence during the past few years. For centuries various body excretions have been used by superstitious natives in combating disease, but it is only recently that urea has been tested scientifically and definite conclusions formed.

Otitis media is a very common condition in ear, nose and throat practice. As a rule, discharging ears are divided into two classes, acute and chronic. By "acute otitis media" we usually mean that the ear has been running for only two or perhaps three months. The term "chronic otitis media" implies an ear that has been discharging for longer than three months. Also, in acute cases the infection is still superficial, that is, the mucous membrane alone is affected, the discharge is practically odourless, and the vast majority clear up under conservative treatment with no impairment in hearing. On the other hand, in chronic otitis media the infection is deeper seated, due to involvement of the bone, which results in a foul-smelling dis-

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charge. Even if the discharge finally ceases, the hearing is often affected. Treatment in chronic cases is also conservative unless symptoms such as fever, nausea, vomiting, dizziness, or paralysis make immediate operation imperative. The main feature in treating chronic otitis media is to keep the ear scrupulously clean. Whether this is done by syringing or by mopping out is a matter of opinion, but the method chosen should be carefully explained to the patient, otherwise the discharge will not be thoroughly removed, or else there is danger of a painful or severe damage to the drum. Obviously this is accomplished best by one who is familiar with the anatomy and can reflect or shine a light into these narrow darkened passages. Under such conditions it is not difficult to remove all the pus and epithelial débris present. Unfortunately, this is not always possible.

Antiseptic solutions instilled into the ear after cleansing are of doubtful value, because it is difficult to use a solution strong enough to kill or inhibit the growth of organisms present without injuring the delicate mucous membrane of the middle ear. On the surface the outlook appears gloomy, for, apart from surgical interference, the great majority of chronic ears seem to discharge indefinitely. Cleanliness, it is generally agreed, is of primary importance, while the use of an antiseptic is of secondary consideration.

The time-honoured practice of instilling alcohol drops saturated with boric acid powder, although effective, is very painful at times. This holds true more particularly in cases of acute otitis media where the mucous membrane of the middle ear is swollen and inflamed. Any one who has experienced the burning sensation of even 50 per cent alcohol, will appreciate a powder or solution which causes little or no pain, provided the antiseptic qualities are equal.

In recent years a number of articles have appeared attesting to the value of urea in various concentrations as a bactericidal agent. The property of urea to dissolve proteins was first noted by Spiro[1] in 1900. Thirty-six years ago, in an account of the action of urea upon proteins, Ramsden,[2] independently, made the very interesting observation that "urea prevents putrefaction". Four years later (1906) Wilson[3] found that 8 per cent urea prevented the growth of *B. coli.* In the same year the first detailed study of urea as a bactericide was published by Péju and Rajat.[4] They found that on media containing urea there was less and less bacterial growth, until media saturated with the compound remained sterile. They also found that, among other organisms, *B. pyocyaneus* was easily destroyed by urea in concentrations as low as 25 per cent. Various forms of cocci (staphylococci, streptococci and pneumococci) were found to be more resistant. A freshly prepared 100 per cent aqueous solution of urea proved to be of definite value as a nasal wash in diphtheria carriers. A valuable contribution by Symmers and Kirk[5] definitely established urea over many other antiseptics. This paper was the result of a series of carefully controlled experiments on numerous organisms and with various concentrations of urea. Quoting from their article "Thus in urea we have a substance which in the dry state is permanently stable, which is practically non-poisonous, which is highly diffusible, and which, even in low concentration (3 per cent), affects the growth of bacteria, is inhibitive to growth at about 8 to 10 per cent, and is markedly bactericidal to non-sporing bacteria in the higher percentages. This bactericidal effect is active in the presence of blood and such-like organic fluids. Urea is also non-irritating to living tissues, and the dry substance may be sprinkled over wounds to almost any extent without any injury to the parts. . . . The drawbacks to its use are that in some cases it produces a considerable amount of pain, which can be met by the administration of morphia, and the fact that urea absorbs moisture somewhat quickly and becomes caked; this can be prevented by exposing it as little as possible to the air."

In summing up their findings, the conclusions were as follows: (1) from our laboratory and clinical tests we conclude that urea as an antiseptic acts in the presence of blood; (2) that it is innocuous to animal tissue; (3) that in the quantities that can be used in wounds it is non-toxic; (4) that by its use at least half the labour necessitated by other methods of treatment is saved; (5) that during its use the processes of repair are not retarded; (6) we believe that the most striking results will be obtained by its use as a first-aid dressing; (7) it prevents suppuration arising in wounds from chronic blood infections.

More recently, Foulger and Foshay[6] again tested the bactericidal action of urea and also found that staphylococci were very resistant. All the thirteen common organisms investigated were destroyed within two hours on exposure to half-saturated urea except *Staph. aureus, Staph. albus,* and *S. fæcalis.* The *Staph. albus* just survived for four hours, but the *Staph. aureus* and *S. fæcalis* were viable after twenty-four hours of exposure.

In the treatment of suppurating wounds with foul purulent discharges urea has been used with beneficial results. Millar[7] reported his findings a few years ago, especially in cases of malignancy. It has proved equally effective in the treatment of chronic otitis media and sinusitis. Even after one application, it is often surprising to note the absence of odour.

In 1937 Lewy[8] noted his results in a small series of cases. Using a freshly prepared 2 per cent solution of urea, he found it of benefit in carcinoma, Ludwig's angina, maxillary sinusitis, cervical adenitis, otitis media and mastoid wounds. In his preliminary report he concluded that, "Its specific effects seem to be: (1) elimination of odour; (2) proteolysis of necrotic tissue; and (3) stimulation of granulation and epithelialization."

Recently, Holder and MacKay[9] stated, "Urea in strong solution has a peculiar property of being able to 'dissolve' proteins and protein substances." Quoting from their article "A 2 per cent concentration of urea is too low to have any appreciable 'solvent' action, and we have been unable to obtain any evidence that urea directly stimulates healing. . . . The effect on healing in all cases is probably entirely passive; *i.e.,* the procedures have no direct influence on cell growth or epithelization but only aid this to proceed normally by removing dead tissue, dried secretions and other hindrances."

In the few available references in the literature urea has been used mostly by itself in different concentrations. Recently, the addition of various substances is now being tried out to increase the destructive action on bacteria. Calcium picrate, urea picrate, and, lately, urea phenolate are under investigation. The phenol tends to reduce the pain caused by strongly hypertonic urea solution on the mucosa. In a recent article, Mertins[10] used urea crystals alone in graded solutions. He was enthusiastic about the successful results obtained in chronic otitis media by using a saturated solution.

Experimenting for the past two years, using urea as a base, many powder combinations have been tried with varying success. Among others, boric acid, iodoform and several protein-splitting enzymes and vegetable digestants were tried, both in powder and liquid form. The one found to be most useful was a mixture of urea and *Carica papaya* or papaw. The latter is a vegetable digestant which is also known commercially as "caroid". This powder was chosen because of its properties, which are somewhat similar to those of urea. Mixed in the proportions of 60 parts urea powder, 15 parts *Carica papaya,* and 25 parts boric acid, it has proved its value in cases of chronic otitis media which resisted all other forms of conservative treatment.

Caroid is a highly concentrated enzyme prepared from the juice of the unripe fruit of *Carica papaya,* a native of South America, the West Indies, and other tropical parts. It occurs as an amorphous or slightly granular powder, varying in colour from white to light brown, very liable to change, odourless, and having a faint pepsin-like taste. It is soluble in water and glycerine, but is almost insoluble in alcohol. An important point to remember is that glycerine solutions of caroid will keep indefinitely, while watery solutions must be made fresh every three hours. Caroid possesses a solvent action on animal proteids and acts equally well in acid, alkaline, or neutral media. Effective in the presence of practically all drugs and chemicals, it may therefore be combined with acid or alkaline antiseptics without destroying its digestive properties. A good sample should dissolve 200 to 250 times its weight of blood fibrin in four to five hours. A freshly prepared 10 per cent solution is very useful in removing a diphtheritic membrane, digesting dead tissue, and promoting healing of abscesses, ulcers and fissures of the tongue. Although powdered caroid acts vigorously upon dead tissue, it does not act upon living tissue, excepting that it exercises a tonic and stimulating influence. In 1937, Harris[11] reported satisfactory results from the use of *Carica papaya* alone in chronically suppurating ears. A fresh solution and the number of cases reported was "fewer than sixty".

Both urea and caroid are hygroscopic and become caked, even on the slightest exposure to air. This has been stressed as a danger, especially where a perforation is small and the drainage easily obstructed. The addition of

powdered boric acid greatly lessens this disadvantage. If the dry powder is used and the caking occurs in spite of boric acid this is easily relieved by a few drops of sterile water or saline. The powder dissolves at once in either solution.

In the articles reviewed on urea therapy no mention was made of the ammoniacal odour of aqueous urea after it has been left standing for any length of time. This is obviated if the solution is freshly made and used within two or three hours. However, caroid in water has a sickening, disagreeable odour, which is often very objectionable to the patient. A few drops of oil of lavender added to the powder completely disguises the odour.

From the experience gained over the past two years in cases of chronic otitis media, better results were obtained from the use of urea and caroid than with any other single method of conservative treatment. These included frequent cleansing of the ear, followed by drops, silver nitrate, zinc sulphate, the insufflation of boric and iodine powder, zinc ionization, and the use of Calot's solution.

Originally, this powder was used by the writer in otitis media involving the Eustachian tube, and perhaps these cases were benefited more than infections in the attic or mastoid, particularly in the presence of cholesteatomatous material or polypi. When granulations or polypi were present better results were obtained if they were removed before instilling the drops. This allowed the solution to penetrate further and act over a wider area. Every otologist is familiar with the thick, stringy mucus associated with a large central or low anterior perforation of the drum, which is so typical of infection in the tube. Although not dangerous as a rule, the discharge is often persistent and resists the usual forms of treatment. The absence of pain or other symptoms makes this condition seem unimportant to the patient and hence the delay in seeking advice.

Theoretically, the ideal solution is one which is mildly bactericidal, which does not injure normal tissue, and which dissolves thick, tenacious mucus. Clinically, urea and caroid have been found more efficacious in this type of case than any other powder or solution.

TECHNIQUE

After drying the ear thoroughly, politzerizing and drying again, a fresh saturated solution is instilled into the ear and left for a few minutes with the patient's head on the side so that the drops will not run out. Quite frequently the patient mentions the sweetish taste as the drops penetrate into the nose and mouth. This is noticed still more if he keeps swallowing, thereby opening the tube. The best results were obtained by using a Eustachian catheter in the nose and applying suction and pressure alternately, in order to remove all possible secretion from the tubal orifice. Injecting the solution through the catheter also helps dissolve the sticky mucus in the tube.

The patient is instructed to dry the ear carefully and to instil the freshly prepared drops morning and night, while lying in the prone position with the head on one side. The auricle is moved back and forth in order to facilitate the entry of the drops, and the patient remains in this position for three or four minutes. By following these directions implicitly and reporting occasionally for a thorough inspection and treatment surprising results have been obtained. However, as in almost all other forms of treatment, certain ears will continue to discharge in spite of every care. In chronic otitis media accompanied by a foul-smelling discharge in the presence of marked bone destruction we can promise the patient a good result. Even if the ear continues to discharge after conscientious treatment the odour disappears and is not replaced by another. This fact alone differentiates the solution from many deodorants, and is greatly appreciated by the patient. In this connection it might be mentioned that this applies equally well to chronic infections in the maxillary antrum following a cold or dental caries. So often the odour is lessened after irrigating the antrum once or twice with a fresh solution of urea and caroid. Thick, curdy pus is also broken down and rendered more fluid, due to the proteolytic action of the powder. In this way it comes away more easily, and usually without pain.

Not infrequently the patient reports a few days after using the drops that the discharge is more profuse than previously. This is due to the pus becoming liquid and running more freely, because, as mentioned above, the drops are non-irritating to normal tissue. A solution of urea and caroid in 25 per cent alcohol is very useful in these cases. Although the powder does not dissolve as well in alcohol as in water, the

alcohol acts as a preservative and the solution can be kept indefinitely. However on a raw surface alcohol causes some pain.

The solution is also helpful in atrophic rhinitis, particularly when ozæna is present. Used by means of a dropper, the greenish crusts are softened and removed much more easily, with little or no bleeding.

The fibrinous exudate following tonsillectomy, which gives such a disagreeable odour to the breath and taste to the patient, is readily dissolved by applying the solution to each tonsillar fossa.

SUMMARY

The combination of urea and caroid in saturated aqueous solution has a definite action on necrotic tissue. It hastens healing, has a stimulating action, and is innocuous to normal tissue.

In strong solutions it has a slight bactericidal action, which is particularly effective on organisms which produce putrefaction.

It practically obliterates all odour, which is not replaced by another.

It is inexpensive.

Finally, by dissolving pus and epithelial débris it allows normal healing to take place.

NOTE.—On submitting this paper to the bacteriological department of the Royal Victoria Hospital, the following report was received from Dr. Hugh Starkey:

"The chief disadvantage of the present combination appears to be the weak bactericidal effect of urea on such organisms as Staphylococcus pyogenes and streptococci, both of which are found very frequently in chronic otitis media, usually mixed with other organisms. One of the difficulties in the choice of a better bactericidal agent is the presence of large amounts of protein material at the site of action, reducing greatly the activity of nearly all the dyes, phenols and cresols. Acriflavine is affected very little by proteins, and, as it is strongly bactericidal, particularly against staphylococci and streptococci a combination of urea and caroid with acriflavine in water or glycerine might be tried."

Following this suggestion, two solutions are under investigation, urea and caroid in acriflavine, 1 in 1,000, and urea and caroid in carbon tetrachloride. At the present time, however, it is too soon to report any definite results.

REFERENCES

1. SPIRO, K.: Ueber die Beeinflussung der Eiweisscoagulation durch stickstoffhaltige Substanzen, *Ztschr. f. Physiol. Chem.*, 1900, **30**: 182.
2. RAMSDEN, W.: Some new properties of urea, *J. Physiol.*, 1902, **23**: 28.
3. WILSON, W. J.: Pleomorphism, as exhibited by bacteria grown on media containing urea, *J. Path. & Bact.*, 1906, **11**: 394.
4. PÉJU, G. AND RAJAT, H.: Note sur le polymorphisme des bacteries dans l'urée, *Compt. rend. Soc. de Biol.*, 1906, **61**: 477.
5. SYMMERS, W. ST.C. AND KIRK, T. S.: Urea as a bactericide, and its application in the treatment of wounds, *The Lancet*, 1915, **2**: 1237.
6. FOULGER, J. H. AND FOSHAY, L.: The antiseptic and bactericidal action of urea, *J. Lab. & Clin. Med.*, 1935, **20**: 113.
7. MILLAR, W. M.: Urea crystals in cancer, *J. Am. M. Ass.*, 1933, **100**: 1684.
8. LEWY, R. B.: Use of urea in diseases of the ear, nose and throat, *Arch. of Otolaryng.*, 1937, **26**: 2.
9. HOLDER, H. G. AND MACKAY, E. M.: Use of urea in the treatment of infected wounds, *J. Am. M. Ass.*, 1937, **108**: 1167.
10. MERTINS, P. S.: Use of urea in treatment of chronic otitis media, *Arch. of Otolaryng.*, 1937, **26**: 509.
11. HARRIS, R.: A treatment of chronic purulent otitis media, *Arch. of Otolaryng.*, 1937, **26**: 522.

THE TREATMENT AND LATER MANAGEMENT OF CORONARY THROMBOSIS*

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PROMPT recognition of coronary thrombosis and the immediate instigation of a well ordered program of management are of vital importance to the patient's chances for recovery. There are few emergencies in clinical medicine in which events occur more suddenly and in which the condition of the patient may change with greater rapidity than in acute occlusion of a coronary artery. This makes the appraisal of any therapeutic regimen a difficult problem. One cannot assume that the present form of treatment is the best available, but the fact that there is considerable unanimity of opinion amongst the profession regarding the management of coronary thrombosis is encouraging.

Immediate rest in bed must be insisted upon following an attack of coronary thrombosis. During these critical moments it is frequently advisable not to undress the patient or to move him from one place to another until his condition has become less precarious. Throughout these early stages treatment must usually be directed to the control of pain and circulatory collapse. Morphine in full therapeutic doses has stood the test of time as an indispensable aid in the control of pain, shock, and the restless anxiety which is so commonly present. Although the repeated use of subcutaneous injections of morphine is frequently necessary, one must be guarded not to administer quantities sufficient to depress respiration. The application of heat or counter irritation to the chest, the relief of flatulence,

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and the administration of an adequate percentage of oxygen are measures sometimes helpful to relieve agonizing pain.

Occasionally the circulatory collapse of the initial period requires immediate attention. If there is venous hypertension with dyspnœa, cyanosis, pulmonary œdema, and venous engorgement, the rapid removal of from 400 to 500 cubic centimeters of blood from a vein may be life-saving. Wolferth feels that this procedure is at times dangerous, and that the indications for its use are not clearly understood. The rapidly-acting stimulants, such as caffein sodium benzoate, coramine, or epinephrin are often used by physicians in this emergency. In serious shock with loss of consciousness, Ernstene has found that injections of epinephrin solution in doses of one-quarter to one cubic centimeter are of value. Under these circumstances, he has also employed subcutaneous injections of caffein sodium benzoate. One has felt that in this emergency the action of these drugs is usually disappointing. The use of epinephrin may be dangerous. If alarming failure of the circulation should occur the slow intravenous injection of 100 c.c. of 50 per cent glucose is beneficial. The use of one of the mercurial diuretics is a valuable adjunct at this stage as in other types of congestive failure.

It is generally agreed that digitalis is contraindicated except in the occasional case in which auricular fibrillation with a rapid ventricular rate persists and is adding to serious heart failure. When given under such circumstances it should be used more cautiously than in other types of congestive failure.

There are instances in which the use of oxygen is of inestimable value. These are characterized chiefly by the presence of marked dyspnœa, cyanosis, air-hunger, Cheyne-Stokes respiration, or uncontrollable pain. Oxygen is administered most efficiently by means of the portable tent, using a concentration of about 50 per cent oxygen. When such equipment is not available it may be given quite satisfactory by means of an intranasal catheter. When the latter method is employed, the catheter should be inserted well into the nasopharynx and the rate of flow set at five to six litres per minute. This gives a concentration of approximately 38 per cent oxygen. Many patients complain of a disagreeable irritation of the nose and throat. The frequent spraying of the nasopharynx with mineral oil tends to relieve this discomfort.

There is considerable experimental and clinical evidence to warrant the use of theophylline ethylenediamine as an effort to improve the blood flow through the coronary system. Middleton advocates its administration immediately after the coronary accident, and advises that it be continued in doses of one and one-half grains three times daily for a period of four to six months. One has found that it is occasionally necessary to interrupt the course of the drug on account of gastric disturbances or insomnia. The combination of one-half grain phenobarbital with one and one-half grains of theophylline ethylenediamine seems to be of value.

Levine has advocated the use of quinidine sulphate during the first two weeks following coronary thrombosis. He feels that this is of value in diminishing the likelihood of ventricular tachycardia or ventricular fibrillation. The drug is contraindicated when any form of heart-block is present. Although it may be wise to administer quinidine sulphate should premature beats arise, it would seem inadvisable to give routinely a drug which may be dangerous when the onset of ventricular tachycardia is a relatively rare complication.

The diet requires special attention in the management of coronary thrombosis. For the first two or three days following an acute attack very little nourishment should be given by mouth. Sips of diluted orange juice, carbonated water, or bits of cracked ice tend to allay the nausea and vomiting which is so commonly present. Fluids should be limited to about 1,200 cubic centimeters in twenty-four hours, unless there is profuse perspiration, when a more liberal quantity may be necessary. As the patient improves one may gradually add toast, fermented milks, buttermilk, and puréed vegetables. Since glucose is the most readily assimilated source of food energy it has assumed an important place in the dietary of these patients. Allan has advised the administration of one-half pound of glucose daily. Master and his associates have reported excellent results with the use of a well-balanced diet containing approximately 750 to 850 calories. These investigators have found that such a regimen produces a reduction in basal metabolic rate of from 15 to 40 per cent, thereby reducing the work of the heart. They advise that the patient remain on a low calorie

intake for a period of from four to six weeks. It is important that the dietary be well balanced, containing a liberal supply of vitamins and an adequate amount of calcium. The studies of Wolbach and Howe on the effect of vitamin C in promoting capillary growth suggests the advisability of supplementing the diet with fresh citrus fruits. Overloading of the stomach must be carefully avoided at all times.

Adequate nursing care is of paramount importance in the treatment of acute coronary thrombosis. Whenever possible day and night nurses should be retained for the first two or three weeks. The nurse should be instructed not to disturb the patient unless she can be of genuine assistance in conserving his energy. She can do much to exclude all visitors, and to make the surroundings tranquil. During these early days, the patient must not be allowed to feed himself but must rely entirely on the services of the attendant. One must insist on the use of a bed-pan or urinal. The bowels should not be moved intentionally for the first two or three days. Thereafter, it is well to insure a loose or slightly formed stool by the use of a mild laxative. The serious danger of straining at stool must be avoided at all times.

A knowledge of the healing process in the myocardium following coronary thrombosis and a realization of the time required to accomplish this repair are of importance in the management of patients with this disease. We know from careful histopathological study of cardiac infarcts that in from five to twenty-two days there is rapid disappearance of the inflammatory process. A well-marked proliferation of connective tissue is present by the end of the third week. After this time regions of diffuse fibrosis are observed, and complete cicatrization has occurred at the end of three months.

A realization of the time interval required for the healing of myocardial infarcts indicates the necessity for complete and prolonged rest. A wound in the heart muscle is not amenable to rest and immobility as is a wound in other parts of the body. It is quite obvious that the time required to heal such an injury is greater than that necessary to heal a similar injury in other parts. Clinicians with the widest experience agree, that providing no complicating factors interrupt convalescence, these patients should remain at complete rest in bed for a minimum period of from five to six weeks. For those who do not convalesce smoothly a longer interval of bed rest is necessary.

When this period is over, gradual, cautious and carefully individualized rehabilitation must be undertaken. The patient is permitted to sit in an arm-chair, without walking, for short but increasing periods each day. Walking should not be sanctioned until he is able to sit in a chair for intermittent periods of seven to eight hours daily without discomfort. This regimen usually requires about ten days, but the progress of this phase must necessarily be controlled by cautious observation of the patient's condition. The principle of rest must be emphasized repeatedly, and even those who convalesce without interruption should be advised to refrain from their occupation for at least three months from the initial attack. When resumption of duties is undertaken it should be on a part-time basis with as many holidays as possible. At least six months and sometimes a year of restricted management are necessary in order to permit the heart to regain reserve strength and to give the patient an opportunity to recover with the least permanent handicap.

One of the greatest advances in our concept of coronary thrombosis has been in the matter of prognosis. No longer is recovery from this cardiovascular accident considered of sufficient interest to justify a case report. A better diagnostic acumen whereby a greater number of early and of mild cases are detected, and a realization of the value of immediate and proper treatment, are factors responsible for this more optimistic attitude. It is now generally known that the chances for survival in the first attack are extremely good, and that life-expectancy may extend as long as seventeen years. The mortality rate probably ranges between 15 to 30 per cent, being slightly higher in ward cases than in those treated privately. In a series of 243 patients, Master and his associates report a mortality rate of 16.5 per cent in 267 attacks, with a rate of only 8 per cent in primary attacks. Cardiac mortality progressively increases with recurrent seizures of coronary thrombosis, and is much better in younger patients than in those of the older age-group. From a study based on a series of 370 patients who were afflicted with this disease, Willius found a mortality rate of 47.5 per cent in first attacks, 69.8 per cent in second attacks, and 75 per cent in third attacks. In 72 per cent of Willius' cases the syndrome

occurred during the sixth and seventh decades of life, a factor which may account for the higher mortality in his series. One would feel that from these and other studies the mortality figures would justify a more optimistic attitude than is generally held toward coronary thrombosis. This improvement in prognosis should be emphasized to patients as such an attitude on the part of the attending physician will promote more cheerful and more optimistic relations with the patient and with the family. This will do much to dispel the profound fear associated with the term coronary thrombosis and will tend to reflect itself in the better progress of the patient.

No opinion can be formed as to the possible degree of future activities until the patient is ambulant and the cardiac reserve can be tested. After the first three months, the presence of congestive failure, of gross enlargement of the heart, or of very low blood pressure is an indication that little activity can be expected. Palmer found that of 212 patients with coronary thrombosis who survived the attack by three months, more than 25 per cent were able to lead fairly active lives. In the remainder, however, dyspnœa on exertion, angina pectoris, or congestive heart failure necessitated marked restriction of activity, or complete invalidism. Mild hypertensives appear to have a more favourable outlook than do those with a relatively low blood pressure. After the first three months, the probability that a patient will be able to lead a fairly active life is almost twice as great in those with normal-sized hearts as in those with cardiac enlargement.

Those who make good recoveries and are free from serious dyspnœa, angina pectoris or gross cardiac enlargement may enjoy such pursuits as golf, shooting, and fishing if performed in moderation. Business activities may necessarily be restricted or modified in some cases; with others, whose financial status will permit, retirement should be considered.

As yet we have no adequate means whereby recurrent attacks of coronary thrombosis may be prevented. A thorough evaluation of the circulatory capacity should be made and management individualized in accord with the findings. "Moderation and common sense in all things" is a motto wisely followed by these patients. Those who are willing to conduct their future on a restricted plane, assiduously avoiding excessive physical or mental strains, emotional reactions, or sudden exposure to cold, being careful in their habits of eating, drinking, and obtaining abundant restful relaxation, do better than those who resent such restraint. Since Lampson has shown so convincingly the vasoconstricting effect of nicotine, it would seem wise to forbid tobacco in all forms to these patients. There is no apparent reason to interdict the moderate use of such beverages as tea, coffee, or alcohol. A periodic course of theophylline ethylenediamine seems to be helpful in many cases.

The application of surgical procedures in the treatment of intractable cases of myocardial infarction warrants further study. Attempt to improve collateral coronary circulation by grafts of pectoral muscle, or omentum would seem the most physiologically sound. At the present time one would hesitate to recommend surgical intervention as long as the condition can be made tolerable by medical measures and by better management of activities.

A lengthy bibliography has been prepared by the author, and, for considerations of space, had regretfully to be omitted. [ED.]

PRESSURE ON BRACHIAL PLEXUS CAUSING SIMULATION OF CORONARY DISEASE.—W. D. Reid observed a series of patients in whom the pressure of a cervical rib or the scalenus anticus muscle on the brachial plexus was the cause of pain simulating angina pectoris. These diagnoses differ significantly in prognostic and therapeutic implications. The syndrome has been found in the absence of a cervical rib; an abnormality in the relation of the first rib and the brachial plexus is the cause. The syndrome has been explained as due to a friction neuritis; the nerves are made taut across the sharp edge of the rib as the result of various unfavourable conditions in the relations of the nerves to the bony structures. More recently attention has been directed to the effect of the scalenus anticus muscle causing pressure on the subclavian artery or brachial plexus, or both. The scalenus anticus may compress the artery or nerves against the cervical rib, if such is present, or it may abnormally elevate the first rib and so interfere with the artery and plexus. If the latter is irritated the scalenus anticus muscle, which receives its innervation from the brachial plexus, may be stimulated to a state of spasm. A "vicious cycle" may be said to exist. Pain, paræsthesia and anæsthesia in the area supplied by the affected nerve are the usual symptoms. The pain is neuralgic in character: it may begin in the neck, spread downward along the arm to the hand and sometimes the reverse way to the head and side of the chest. Rotation of the head toward the affected side or a downward pull on the shoulder may increase the pain. Loss of or decrease in amplitude of the radial pulse and a bruit over the clavicle are other symptoms and signs that may be noted. The simplest form of treatment is that of elevation of the shoulder upward and backward by a sling. Physical therapy is then used in an attempt to develop the trapezius and levator anguli scapulæ muscles. If such measures prove unsuccessful and the symptoms warrant it, surgical treatment is advised.—*J. Am. M. Ass.*, 1938, **110:** 1724.

DIVERTICULITIS OF THE SIGMOID COLON*

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DIVERTICULA are found throughout the gastro-intestinal tract from the œsophagus to the rectum. They may be congenital or acquired. The discussion in this paper will be confined to those found in the sigmoid portion of the colon, and which are acquired in type.

Diverticula of the colon were first described by Cruveilhier in 1849. In 1853 Virchow gave a minute description of the condition, referring to it as chronic adhesive peritonitis. In 1859 Sidney Jones reported a case of acute diverticulitis which resulted in a fistula between the bladder and the sigmoid colon. However attention was not generally attracted to diverticulitis until 1898, when Graser, as a result of post-mortem studies, emphasized the frequency and significance of the disease. The symptomatology was first described in 1907 by Mayo, Wilson and Giffen. They reported five cases in which a portion of the sigmoid was excised for obstructive diverticulitis, the first instance recorded in which an actual demonstration of the pathological changes in diverticulitis was made during the life of the patient. Haenisch, in 1912, was the first roentgenologist to recognize and describe the condition. The first papers on the subject by American x-ray men were published by Carman and Case in 1915.

In true diverticula, a good example of which is Meckel's diverticulum, the sac is formed by all the coats of the bowel, while in the acquired, which are by far the more common, the mucous membrane herniates through small openings in the muscular coat. Why and how do these pouches form, and why do they wait until middle age before they appear? It is a well known fact that they are rarely found before forty. Constipation has long been thought to play a leading rôle in their inception, but Spriggs in a control series found the incidence no greater in constipated individuals. It is also well known that constipation is much commoner among women, yet diverticula are much commoner in men. Another theory is that of fat infiltration of the musculature of the intestine with consequent weakening. So far no one knows exactly the reason for their appearance, but it may be surmised that, like hernia elsewhere in the body, they come when age with its attendant wear and tear and atrophy of tissues has thinned the muscular fibres and separated them. These herniations are most apt to take place in those areas where the blood vessels pierce the wall of the bowel, and along the mesenteric border, but they may occur at any point of the circumference of the bowel, with the exception of that part which is augmented by the longitudinal bands.

PATHOLOGY

The diverticula present a constricted neck at the point where they traverse the thickness of the wall of the bowel and a dilated body which expands after the sac has passed beyond it. The size of the pouches is usually 4 to 8 mm. in diameter. Inflammation may develop as a result of an accumulation of fæces within the sac. After this material dries out it may produce irritation of the mucosal lining of the pouch and consequently an inflammatory reaction. Once the mucosal lining of the diverticulum becomes inflamed it may begin to disintegrate and ultimately ulceration may occur. These changes then extend to adjacent tissues, producing a sigmoiditis and perisigmoiditis. With the œdema and thickening the neck of the diverticulum may become obstructed and the sac become dilated and ultimately rupture. With the perforation, abscesses may form which usually rupture into some surrounding viscus such as the bladder or some other bowel segment, or they may rupture externally. Because of the slow progression there is usually time for the development of a protective wall of inflammatory and fibrous tissue, and thus a diverticulum rarely perforates into the abdominal cavity. When we consider the diverticulum with its narrow bottle neck, and its location in a region bathed in fæces, and swarming with bacteria the wonder is not why do we have diverticulitis, but why so seldom.

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CLINICAL FEATURES

Cases of the disease may be classified clinically into five groups.

Group 1. *Diverticulosis or the pre-diverticulitis stage.*—Diverticula are found in 5 per cent of all x-ray examination of the colon, but only in about 15 per cent of this number do we get inflammatory change, and the much larger number of symptomless diverticula we now classify as cases of diverticulosis. Patients in whom symptomless diverticula are found are usually told that the diverticula have no significance, and are dismissed without further instructions. This I believe to be a mistaken attitude on the part of the profession. The best time to treat diverticulitis is when it is diverticulosis. Even at the risk of creating more patients with colonic consciousness, the patient should be told that he has a diverticulosis and given instructions on the care that he should take to prevent, if possible, a diverticulitis. The harmful effect of laxatives, bran, and the popular roughage diets should be pointed out. The diet should be bland, and yet contain sufficient bulk to promote movement of the bowels without artificial aids. There is no harm in the use of mineral oil for short periods, but its continuous use should be discouraged. If the patient cannot get along without some lubrication olive oil is to be recommended.

If our prophylactic treatment has been of no avail we may be confronted with diverticulitis in any one of four types.

Group 2. *Self-limiting diverticulitis and peridiverticulitis.*—This is the type which is so often spoken of as having the symptoms of left-sided appendicitis. One or more of the diverticula become the seat of an inflammatory reaction. The patient complains of pain in the left lower quadrant and usually gives a history of some disturbance of his bowel movement, sometimes of constipation, but more often of loose stools. Fairly frequently he complains of frequency of urination and "burning". On examination tenderness and rigidity are found in the left lower quadrant, and frequently a mass is palpable in the same area. There is a moderate degree of fever and the leucocyte count is increased. In the differential diagnosis ureteral stone, ureteritis and pyelitis, all of which will give lower left quadrant pain and vesical disturbances, have to be ruled out. Disturbances of bowel function, such as loose stools are not common in these three conditions, and a palpable mass is never found. The urinary findings of blood and pus, which are almost always present in these conditions, are uncommon in diverticulitis. Salpingitis has to be considered, but, unlike diverticulitis, is not so common in the middle-aged group as it is in the younger ages. A careful pelvic examination will usually clinch the diagnosis. Torsion of the pedicle of an ovarian cyst and volvulus of the sigmoid will also give pain in this area, but the pain is much more severe than that of diverticulitis, and has a much more sudden onset. The medical care of this group has not received the attention in the literature that it deserves, chiefly because most discussions of diverticulitis are presented from the surgical viewpoint. Too often these patients are allowed out of bed as soon as the pain has subsided and the temperature has returned to normal. Here, as in group 1, careful management may be the means of preventing the occurrence of the more severe types of the disease. As rest of the diseased part is a requisite in treating inflammation, the patient must be kept in bed until the inflammation has subsided. The tenderness and the mass will slowly disappear, and usually at the end of two or three weeks nothing abnormal will be found on examination. It is a mistake to allow the patient out of bed for another two or three weeks, to complete resolution of the more chronic process which underlies the acute inflammation which was responsible for the symptoms. Next in importance to rest in bed is the question of maintaining an adequate intake of fluids and food. At the onset, especially if a mass be present and there is obstruction, nothing is given by mouth, and fluids are administered by vein or subcutaneously. As the acute process subsides, oral feeding is gradually started, beginning with residue free-foods and slowly increasing the amount. As the patient improves the diet should slowly approach the type prescribed for cases of diverticulosis as outlined earlier in the discussion. Whether the application of heat to the abdomen hastens resolution of the inflammatory mass may be questioned. Personally, I believe it to be of value, providing it is applied in a manner which does not increase the discomfort of the patient, as is so often the case with turpentine stupes.

Group 3. *Diverticulitis with abscess formation, resulting in fistulæ.*—Very rarely does an

acute diverticulitis perforate into the peritoneal cavity. When such an accident does occur the patient presents the usual picture of a perforation of the intestine, and immediate surgical interference becomes necessary. The more usual course of events is the formation of a localized abscess, which may rupture externally or into some surrounding viscus such as the bowel or bladder. An enterovesical fistula is much more often the result of diverticulitis than of carcinoma. The treatment of the cases in this group is surgical and does not come within the scope of this paper, although a word of warning to the general practitioner who does his own surgery is probably in order. These cases present unusual difficulties and should be left to the expert surgeon.

Group. 4. *Diverticulitis complicated by obstruction of the bowel.*—In acute diverticulitis the obstruction is the result of infection with its accompanying inflammation and œdema; chronic obstruction is due to hyperplasia. This group might also be known as the hyperplastic stenosing type, and is of especial interest to the practitioner because of its mimicry of carcinoma of the sigmoid.

Group 5. *Carcinoma developing on a diverticulitis.*—This group is not so common as was once thought, but in rare cases the carcinoma may have such a definite relationship to the diverticulitis as to make it reasonable to suppose that infection, and the chronic irritation of hardened fæcal masses in the diverticula, might well have been the cause of cancer developing. The fact that cancer may develop on a diverticulum is sufficient reason for keeping our known cases of diverticulosis and diverticulitis under observation, so that should a malignant change occur we may know it as early as possible and act accordingly.

DIFFERENTIAL DIAGNOSIS

Probably many of you have had the experience of making a diagnosis of carcinoma of the sigmoid and giving a poor prognosis, only to have the patient confound you by surviving for years as a living testimony to your mistake. This is not so serious for the patient as the opposite error of mistaking carcinoma for diverticulitis. If the two conditions are kept in mind in all cases of obstruction of the sigmoid fewer mistakes will be made, but a most difficult differential diagnosis still remains. Diverticulosis is practically non-existent under 35 years of age, and diverticulitis rare under 40. We can therefore exclude it as a cause of sigmoid obstruction in the younger age-groups. However, the majority of cases of carcinoma of the sigmoid are seen in the same age-group as the majority of cases of diverticulitis, so that the age of the patient does not give much help in diagnosis. In diverticulitis we frequently have a long history of recurring vague abdominal distress, with periods of acute illness. This story, of course, is usually lacking in carcinoma. The finding of blood in the stool is much more characteristic of carcinoma, as is tenesmus. However, the last case of diverticulitis that has come under my care had no long history of abdominal distress, did have blood in the stool, and tenesmus was her most distressing symptom.

The x-ray is probably our best single diagnostic method, if properly carried out. The ordinary gastro-intestinal series is not sufficient. Unless the obstruction is severe a barium meal should be observed, not only at twenty-four hours but at forty-eight. Diverticula that will not fill in the early hours of the examination may show up later. Even more important than the meal is the barium enema, further supplemented by the introduction of air into the colon, the so-called "contrast enema" which has been particularly helpful in colonic diagnosis. However, as Graham has pointed out, the x-ray, helpful as it is, is only correct in 60 per cent of cases. Sigmoidoscopy should always be done, although here again the findings are often disappointing. Frequently the portion of the sigmoid affected is beyond the reach of the instrument.

Indirect signs in favour of diverticulitis are the relative immobility of the bowel in a segment which is normally movable, and sharp angulation of the lumen of the bowel. These two signs are due to the fairly large area of inflammation surrounding the affected part of the sigmoid which distorts the colon. Again bleeding internal hæmorrhoids may be observed which may account for the blood in a case which otherwise clinically looks like diverticulitis.

If a positive diagnosis cannot be arrived at after all examinations have been complete, I believe in putting the patient to bed, giving a low-residue diet, mineral oil by mouth, heat on the abdomen, and in women daily hot douches.

This is kept up for two to three weeks and then the examinations are repeated. If the case is one of diverticulitis frequently there is a marked improvement in the symptoms. If a mass has been palpable it becomes less so, and the roentgenologist, who formerly was in doubt, may now give a positive diagnosis. In all cases where the probability of cancer has not been fairly well ruled out the abdomen should be opened and the bowel examined. In diverticulitis the length of obstructed bowel is usually greater than in carcinoma, and it is usually much more bound down. However, even with the bowel in his hand the surgeon may not be able to differentiate the two conditions. If the lesion is resectable it will be left to the pathologist to make the final diagnosis.

SUMMARY

1. An attempt is made to divide diverticulitis of the sigmoid colon into 5 clinical types.

2. The importance of prophylactic treatment in the stage of diverticulosis is pointed out.

3. The value of prolonged rest in bed in the treatment of the acute case of diverticulitis is stressed.

4. The difficulties in the differential diagnosis of diverticulitis of the hyperplastic stenosing type and carcinoma of the sigmoid are discussed.

THE SURGEON'S RESPONSIBILITY IN ONTARIO ACCIDENT COMPENSATION CASES*

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IT is interesting to note that the Workmen's Compensation Act came into force in 1915, and that no provision was made until 1917 for medical aid and then only for one month. Later, in 1919, the Act was extended to include all medical aid, which comprised surgical aid, hospital and skilled nursing services. In other words, the Act began to operate without the doctor, a surely unusual paradox in view of the doctor's position today. At the present time the Board is the largest purchaser of surgical services at fair rates. You do not need to work for them, and, necessarily, the Board can dispense with your services if considered unsatisfactory. Difficulties can be discussed with the Board and consultations are often suggested not only for the benefit of the patient but for your own protection.

This paper is intended to show how the profession can not only, by a proper interpretation of the Act, increase the efficiency of the working of the Act, but also raise the standards of treatment of traumatic cases and thus lower the costs of injuries in industrial operations. Proper reporting of cases to the Board therefore becomes the first requisite of the Act. No doctor should expect the Board to assume the liability of a case until the employer has notified the Board by the No. 7 sheet that an accident has taken place, giving details showing sufficient cause to account for the type of injury reported by the doctor. These facts being considered, and when the liability is assumed, the surgeon's report form is sent to the doctor and later his account form. The profession through a closer cooperation with the employer can improve reports on No. 7 sheets very much. Often this sheet is sent in with the statements: "Injury to arm", "Smashed finger", "Strained back", etc. Any such reports convey no idea of the extent of severity of the injury, when additional remarks would give adequate information and assist all concerned to obtain a proper perspective of the case. It is important therefore that the surgeon's first report be complete with full details of injury.

Progress report forms are expected from time to time, to enable the surgical staff of the Compensation Board to form an opinion of the progress of the case and the efficiency of the treatment the injured worker is receiving. These reports can be improved. Perhaps no progress reports are so difficult to make out as those on fractures, and none so misleading to the Board. True, where a bad fracture takes place it is often impossible, even after perfect reduction, to estimate the probable disability,

* An address given at the Annual Meeting of the Ontario Medical Association, Toronto, in May, 1938.

but when reduction is unsatisfactory, or if after two months satisfactory union is not taking place, then a definite cause for such a condition should be sought. Inadequate immobilization is the most usual cause for such a condition if reduction is obtained, and if reduction is not satisfactory, then steps should be taken to see that this is accomplished. Watson Jones, of Liverpool, England, even goes so far as to state that, "Incomplete immobilization and immobilization for too short a period are the factors responsible for delayed union and non-union, whether in the shaft of a long bone, neck of femur or carpal scaphoid bone."

Carbon copies of progress reports, to my mind, might help the doctor to remember what he had previously reported, as in one case investigated I found the doctor had written in answer to probable duration of disability, two months four times, and once three months. Such a progress report is a grave reflection on the surgeon's ability to estimate duration of disability.

If a fracture is not uniting properly the progress report should say so, and the surgeon should, in my opinion, ask the Compensation Board for a consultation or for removal of the patient to a recognized fracture centre. The expense of such removal is trivial compared to the costs of the long delay due to non-union and the possibility of permanent disability. This is one of the phases of surgical practice where the surgeon can "shout for help" and get it. No badly united fracture is any advertisement to a doctor and surely places him in none too favourable light with his employer. I have come to the conclusion that the treatment of bad fractures is too frequently undertaken by surgeons, who, in the light of recent developments of fracture treatments, cannot adequately deal with them.

There is not enough cooperation between doctors in various areas in these difficult cases, for I believe that the efficient treatment of fractures represents the highest surgical skill in the field of surgery. If you do not work with your colleague he may point to a bad union as an example of your lack of skill, even if some of his own are no better. We have a definite responsibility for improving the treatment of fractures. Recently I heard of a doctor who, in treating a case of fracture of the femur, applied traction by means of a wire through the upper fragment. Should not some competent body in our profession control such a doctor for the benefit of both the public and the profession? The day has arrived when we can no longer condone incompetency in our profession.

Let no surgeon deceive himself that a large array of gadgets or instruments qualifies him to become a fracture specialist, because you all know that it is the knowledge of how or when to use these instruments or, rather, when not to use them that counts. The x-ray has only enabled us to strive for better anatomical results; the functional results are still up to the surgeon.

The surgeon must assume the responsibility for hospitalization of accident cases. Hospitals today are too often boarding-houses both before and after operation. The Compensation Act states that when the injured is in need of "skilled nursing services", such services shall be paid for by the employer. First, the assurance that the employer is responsible for the liability of hospital costs should be ascertained. I know of one hospital account for $185.00 where the surgeon's own diagnosis threw the case out of compensation.

Unnecessary delay before or after any surgical procedure costs money. Nothing should be done prematurely to endanger the patient, but too long delays are common after plaster casts are satisfactorily applied to fractures. Usually there is no need for these patients to remain in the hospital, especially where walking casts and casts of the upper extremities are used. These cases can be seen by the doctors outside when necessary.

How far is the surgeon held responsible in preventing infections? At the onset I will admit that there are rare infections that cannot be prevented; but these are very rare. First and efficient treatment should be the surgeon's responsibility. True, some employees may not report their minor injuries, and infections sometimes follow, but where first aid is obtainable and a workman does not avail himself of it or report to the doctor, then such a worker should be warned of the danger or even be discharged for non-compliance with his duty. The surgeon to my mind is directly responsible to his company for preventing these infections. This point cannot be too greatly stressed. We have in one of our First Aid Station Reports in 1936, of 3,721, and in 1937, 3,717 dressings done without a single infection. Naturally, then, if the doctor is doing first dressings he must be held

responsible by the Board if infection takes place. Infection in our work last year in compensable cases was over 9 per cent, and in view of the progress in asepsis and antisepsis, I believe we are using too many antiseptics and not enough asepsis. In some clinics only white soap and sterile water is used and not any antiseptic, especially no astringent antiseptics. Oils and grease are best removed by benzine. I have definitely formed the conclusion that too many surgeons daub on iodine and fail to cleanse the wound.

Careful cleansing and removal of injured tissues, even using a local anæsthetic if necessary, is important. All punctured wounds and those suspected of harbouring foreign bodies should be probed or opened to the bottom and drained, if necessary, with a wick. In x-ray plates of fractures of small bones of the hand or foot do not mistake foreign bodies for bits of bone. In one instance I know that rock quartz was mistaken for fragments of bone. Local prevention of infection is not only necessary but other means such as toxoids and serums are at our disposal and may be administered. Infections always cause longer, often prolonged and permanent, disability of the part, sometimes necessitating amputation, and the further danger of a general blood stream infection makes the problem a very serious one.

Amputations of various parts may also cause considerable anxiety. Too long surgeons have amputated parts without giving sufficient consideration to the need for certain types of stumps, most suitable for artificial appliances. Today, with knowledge gained from war experience, the surgeon must give consideration to these factors. Also the workman must be considered from the standpoint of obtaining the best that can be done to rehabilitate him into his former work. Many hands following injuries are neither useful nor creditable to surgery. The aim should be to obtain useful parts and not save parts that can only be a hindrance to the patient earning his livelihood and later have to be amputated. One of my first duties was to try and correlate the work of the artificial limb makers with the results of surgery and there is still room for improvement.

Having obtained the best treatment of these accidents, what are the best methods of correcting defects and restoring lost functions? Many methods are used—physiotherapy, long and short wave diathermy, active and passive manipulations, massage, etc. Frankly, I believe many of these treatments are often used as a result of bad surgery. Now what is the relative value of these treatments? I am beginning to think the only one that offers much help is active movement by the patient himself under supervision. Most of the others are palliative, and Mr. Watson Jones says "passive manipulation in most cases is harmful". To get psychological control of the patient and to persuade him to begin early and practice active movements which are often painful is a great responsibility of the surgeon. Further, the surgeon must have the cooperation of the employer to provide light work for the injured man. Today in compensation work, 75 per cent of the injured workers are reported as returning to their former work instead of to light work. You may say this is the company's loss. True, but you are constantly piling up for yourself bad surgical records. The profession as a whole have accepted this attitude too long. Most companies will comply if properly approached, and if a company refuses to do so I would discuss the fact with the Compensation Board. Where a man returns to light work his compensation is cut 50 per cent, but the psychological factor of the patient returning to work does away with malingering. Further, provision for light work will often prevent many minor injuries from going on compensation. The humane action of an employer offering a job does much to overcome the strained relations that often arise in these accident interruptions; also the company will save money and the surgeon will have better records. The wages paid for light work should be such that the injured is earning more than full compensation awards, which should encourage him to strive for his full or former earnings.

Now before a workman returns to work or is taken off compensation the employer must send to the Board, No. 9 Form, which states that the employee has either returned to work or is able to do so, based as a rule on a doctor's opinion. Companies have not taken their compensation costs seriously enough, and hence many incomplete records have been kept. If a record of every accident case, after its completion, could

come before the manager, I am sure he would be greatly surprised. Since the doctor is usually responsible for reporting when a workman is fit to resume his work, it is your responsibility to see that the Board, the workman and his employer are notified. If this is not done the man may delay returning to work or not return at all. If a workman leaves the area where he worked, an estimate of probable length of disability should be sent to the Board by the doctor, especially in minor injuries, as many do not report promptly to another doctor. Compensation costs could be substantially reduced if this were done. Finally, the Compensation Act is not a "Doctor's Act", but an Act with a Board given powers to collect sufficient funds from any industry to pay for loss of time and disability awards, plus the cost of administration. Disability awards and costs are mainly the result of the doctors' judgment, his *effective* treatment, and his co-operation with the Board and the employer in order that justice may be done to all concerned.

If we can be efficient in handling such cases, then we will surely be able to deal with any larger plans of medicine which may be inaugurated by the state or industry. I thought you might be interested in some compensation costs which might have been lessened by more efficient surgical services.

UNUSUAL COMPENSATION COST CASES

Case 1.—Fractured clavicle; movement in old fracture. Claimed accident. Doubtful. Wired. Total medical aid and compensation $782.54.

Case 2.—Fractured clavicle. Wired. Both cases from the same mine. Total medical aid and compensation costs $1,484.97.

Case 3.—Fractured condyle of femur into knee joint; later, unnecessary opening of knee. Final result, knee joint had to be ankylosed. Compensation and pension $5,757.91. Medical aid $729.40. Total cost $6,487.31.

Case 4.—Right inguinal hernia. Compensation $1,628.67. Medical aid $1,316.05. Total $2,944.72. At operation appendix removed. Followed by subphrenic abscess. Drainage. Living suture operation later, then third and final repair of hernia.

Case 5.—Fractured ankle joint. Compensation $1,416.55. Medical aid $1,099.30. Total $2,515.85. Hospitalization period too long before efficient treatment was instituted.

Case 6.—Fractured femur. Total $1,939.12. Reduction incomplete; non-union. Later, open operation. Good results.

Case 7.—Fractured patella. Open operation. Compensation $996.31. Medical aid $448.55. Total $1,444.86.

Case 8.—Fracture both bones of the leg, middle third. Off work 344 days. Compensation $1,132.33. Medical aid $220.00. Total $1,352.33.

Case 9.—Comminuted fracture of radius and ulna, middle of arm. Off 238 days. Compensation $694.17. Medical aid $352.00. Total $1,046.17.

Case 10.—Fracture of both ossa calcis; not reduced. Hospitalization 234 days. Off 460 days. Compensation $2,835.41. Medical aid $1,176.00. Total $4,011.41. This case is not yet settled.

CARPAL SCAPHOID FRACTURES FOR 1937

Case 1.—Old injury? Off 189 days. Light work. Operation disclosed recent injury. Compensation $620.20. Estimated medical aid $206.00. Total cost $826.20.

Case 2.—Off 205 days. Operation. Compensation $643.95. Medical aid $270.00. Total $913.95.

Case 3.—Injured on February 10, 1937. Operation required. Still off; 392 compensation days cost $1,303.33. Medical aid $311.85. Total costs $1,615.18.

Cases 4 and 5.—Off 48 and 73 compensation days respectively.

N.B.—There are 6 compensation days to a week.

AMIDOPYRINE AND AGRANULOCYTOSIS.—A. Buus Hansen and C. Holten note that between May, 1933, and July, 1934, as many as 41 cases of amidopyrine agranulocytosis have been recorded in Denmark, and that 37 of them terminated fatally. With such a high death rate, the opportunities for investigating the subsequent reaction to amidopyrine of patients who have recovered from an attack of agranulocytosis have been scanty. The authors have, however, studied this in the case of a woman, aged 35, suffering from chronic rheumatic polyarthritis, for which she was hospitalized on three different occasions, the first being in 1932. Courses of treatment with amidopyrine were followed by signs of agranulocytosis, including pain in the throat, cough and fever on two if not three occasions, and on one of them it was the perusal of an article in the daily press which led the patient herself to discontinue taking amidopyrine. She had taken about 380 grams in the course of 14 months before her sensitiveness to amidopyrine became apparent. When she was admitted for the third time to hospital in 1935 her acquired sensitiveness to amidopyrine was investigated, leucocyte counts being undertaken before and after the administration of 0.2 grams of amidopyrine. Altogether 49 counts and differential counts were recorded. It was found that in the course of the first hour or two after the administration of the amidopyrine there was an initial fall of the granulocytes from 10,000 by 7,100. There followed a brief rise, succeeded by a prolonged fall to 1,900 granulocytes. Thereafter there was a slow rise, but it was not till four days after the administration of amidopyrine that the granulocyte count returned to normal. The main conclusion is that the patient who has recovered from amidopyrine agranulocytosis is remarkably sensitive to even quite small doses of this drug.—*Ugeskrift for Laeger*, March 5, 1936, p. 193. Abs. in *Brit. M. J.*

Case Reports

HYPERPARATHYROIDISM ASSOCIATED WITH OSTEITIS FIBROSA CYSTICA

BY H. S. SHARPE, M.D., C.M.

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August 30, 1937.—The patient was a man of 52 years, weighing 200 pounds. He had complained of generalized aches and pains for three or four months. The pains were described as being of a rheumatic or neuritic type, and were located mostly in the lower extremities. The knees felt stiff, the feet seemed to drag, and he said he felt lame. Mention was made also of pain in the left upper extremity, vaguely referred to as the shoulder. There was also pain and swelling in the left side of the face, in front of the ear, and the patient experienced pain on chewing. He thought he had something wrong with the temporo-mandibular joint. Hard, and moderately tender swellings were complained of in the right hand, the left clavicle, and in both tibiæ just below the knees. The left half of the thyroid gland, he reported, was increasing in size. There was a feeling of malaise, weakness, and lack of ambition. The patient also complained of an abnormal thirst and a bad taste in the mouth and he persisted in using various preparations as a mouth wash.

Physical examination.—The heart was normal in size; no murmurs were present but there was occasional irregularity. The blood pressure was 140 mm. systolic and 86 mm. diastolic. The pulse rate was 66; temperature 99.2.° The lungs were found negative. The abdomen was normal. The teeth were examined and radiographed, and reported normal.

The left lobe of the thyroid gland was noticeably enlarged, and, on palpation, a hard globular mass could be outlined. The basal metabolism was investigated and found to be – 2 per cent.

Several irregular enlargements were observed in the following bones: head and lower third of the right 4th metacarpal, upper half of the first phalanx of the right 4th finger, upper fourth of both tibiæ just below the tubercles, upper part of left ramus of the lower jaw, and in the middle third of the left clavicle.

Examination of the urine.—Specific gravity 1.018; reaction acid; no albumin or sugar; no blood or pus cells, and no casts. A culture was negative. Blood count: hgb. 80 per cent; 4,630,000 erythrocytes; 15,200 leucocytes. The Wassermann test was negative. The blood calcium was 17.4 mg. per 100 c.c. Blood serum and the blood phosphorus was 2 mg. per 100 c.c. No estimation of phosphatase was done.

Radiographs were taken of the affected bones, and Dr. Carter reported as follows: "Head and lower third of right 4th metacarpal—cystic multilocular dilated areas; upper half of first phalanx of right fourth finger—same as metacarpal; upper fourth of right tibia —cystic enlargement; periosteum intact; upper half of left ramus of lower jaw—cystic enlargement, periosteum intact; middle third of left clavicle—cystic enlargement, periosteum intact; lateral skull—general granular appearance of skull."

The cystic changes in the bones and the accompanying constitutional changes were evidently due to the parathyroid tumour.

Under local anæsthesia the tumour was shelled out quite readily from the posterior surface of the upper part of the left lobe of the thyroid gland (September 18th). A photograph of the tumour is shown in Fig. 1.

Dr. Peirce's pathological report of the tumour is as follows: "Specimen is an encapsulated, reddish-brown, roughly cuboidal tumour 7 x 6.5 x 4 cm. weighing 120 grams (Fig. 1). One face is set with many mammillary projections, or lobules, varying in size from a

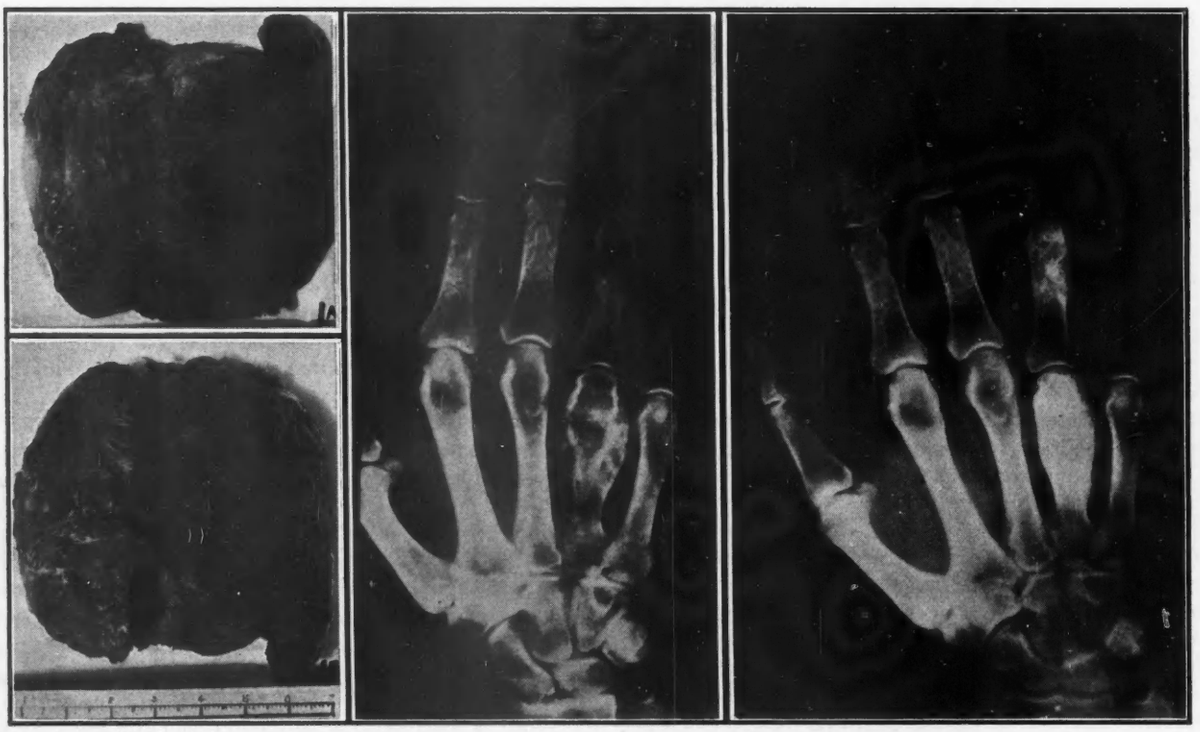

Fig. 2 Fig. 3

Fig. 1a.—Adenoma of the parathyroid; anterior view. **Fig. 1b.**—posterior view. **Fig. 2.**—Metacarpal and phalanx *before* operation. **Fig. 3.**—Metacarpal and phalanx *eight months after* operation.

pea to a cherry. Adherent to one side and separated from the tumour proper by the capsule is a mass of what appears to be thyroid tissue, 7 x 1 x 1 cm. On gross section the cut surface shows a moderately dense brownish-yellow tissue, with an obscurely radiate structure. The central area, 1.5 cm. in diameter, is somewhat denser in structure than that of the periphery and contracts a little on section. The outer two-thirds of the cut surface presents a uniformly yellowish-brown, obscurely lobulated new growth, which ends with a sharp border beneath the capsule. The latter is much darker brown in colour and varies in thickness from 1 to 3 mm.

"*Microscopic appearance.*—The capsule is a vascular connective tissue and exhibits many areas containing granules of brown pigment suggesting old hæmorrhages. It is not invaded by the cells of the tumour proper. The latter are round or oval with a small amount of clear cytoplasm and fairly large, deeply-staining nuclei. They are arranged in nests or islands with a scanty framework of connective tissue. Occasionally they lie side by side in a palisade structure. The area within the palisade is sometimes a small cyst filled with structureless granular débris, but more often a loose connective tissue surrounding a blood capillary. The microscopic appearance of the central portion of the tumour is identical with that of the periphery except that in the former the tumour cells are larger, due to a much larger amount of clear cytoplasm. There are no oxyphilic cells. Diagnosis—adenoma of parathyroid."

The beneficial effect of the removal of the tumour was noticed almost immediately. Improvement continued, and the patient reported a gradual return to his usual vigour. The gait changed from the dragging shuffling type to a normal one. The palpable enlargements in the affected bones gradually were reduced and the slight tenderness that existed formerly disappeared. The first bone to show improvement was the mandible. In less than a week the enlargement had almost disappeared. On September 27th the blood calcium was found reduced to 10 mg. per 100 c.c., and the blood phosphorus had risen to 2.4 mg. per 100 c.c. Further blood analysis on October 8th showed a blood calcium of 10.3 mg. and blood phosphorus of 2 mg. The final estimation of blood calcium and phosphorus was done in November and the calcium was found to be 10.3 mg. and the phosphorus 1.9 mg. A basal metabolism test was done on this latter date and reported at + 2 per cent.

Radiographic studies were made of the recedence of the cystic bone enlargements at various intervals. The cystic appearance gradually disappeared, the tumour became smaller, and a deposition of calcium was gradually taking place. Accompanying cuts of radiographs of bone changes taken before operation and eight months after operation show the changes occurring in that interval. See Figs. 2 and 3.

In view of such findings and results it was interesting to look up the former history of this patient.

In 1933 he had had an attack of left-sided pain in the kidney region, diagnosed as renal colic. Hypodermic medication was required on two occasions and hot fomentations were applied for two days. Examination of the urine showed granular casts and there was a trace of albumin. No further investigation was made, as this was an isolated painful attack, and there was never any recurrence.

In October, 1935, the patient came to the Clinic and complained of gastro-intestinal distress, bad taste in the mouth, excessive thirst, and polyuria. He stated he lacked "pep" and ambition and had no desire for exercise, which was unusual for him. The enlargement of the left half of the thyroid was also noted. The blood pressure then was 170, systolic, and 90, diastolic. The blood count was: hgb., 75 per cent; 3,760,000 erythrocytes; 9,300 leucocytes. The differential count was normal.

Examination of the stomach contents showed no free HCl. Fluoroscopy of the gastro-intestinal tract with a barium meal was negative. The gall-bladder dye test revealed no gall-bladder shadow. The amount of a 24 hours' specimen of urine was 2,880 c.c.; specific gravity, 1.009; urea 0.4 per cent; no albumin, casts, blood, or pus cells, and no sugar. Blood urea nitrogen was 21 mg. per 100 c.c., and the creatinine 2 mg. per 100 c.c. The basal metabolism at this time proved to be – 10 per cent.

The diagnosis of chronic interstitial nephritis seemed evident as well as chronic cholecystitis, and also a secondary anæmia. It was evident that there was some disturbed glandular function and at that time he was given thyroid extract, and whole pituitary gland. There were no bone changes then and the enlargement in the thyroid gland, in view of the basal metabolism rate, was interpreted as a silent adenoma.

The patient did not consult us again until the end of August, 1937, as previously stated. By that time, in looking backward at the progress of the case, it is remarkable that he exhibited all the classical signs and symptoms—renal colic, the interstitial nephritis type of kidney function, polyuria, polydipsia, gastro-intestinal vagaries, anæmia, asthenia, shuffling gait, raised temperature, bone changes and blood chemistry abnormalities in calcium and phosphorus—accompanying a parathyroid tumour.

A review of the literature concerning the above type of case was made through the courtesy of the Package Library Service of the American College of Surgeons. The first case reported was that of Mandls, in 1925. Since that time various writers have collected statistics and reported their findings. It would appear that the tumour in this case is the largest reported. Further features of the case are that the signs and symptoms were typical and classical, and the results from the removal of the tumour were ideal.

Therapeutics and Pharmacology

FIRST AID IN FROST BITE*

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Considering that one-half of our population works, and the other half plays in freezing temperatures, one is amazed at the amount of misinformation as to first aid in frost bite and the unnecessary torture caused thereby. Most frequently one is told to rub the part vigorously with snow. It is my contention that misapplied first aid causes as much damage as the cold.

Most substances lose their elasticity when frozen, whether they be rubber or steel or tissue. We have only to roll a piece of frozen meat between the fingers to realize what happens. The capillaries have become tiny brittle icicles and the cells and spaces are filled with sharp ice crystals. The slightest motion not only causes death of the intimal cells *per se* but thereby liberates the blood-coagulating principles. This coagulation may cause gangrene in tissue which is otherwise little damaged. *Therefore the utmost gentleness is indicated.*

Again, we must remember that circulation in the part has been arrested and consequently there is no way for the flesh to dissipate any extra heat which is applied to it, and the greatest caution must be observed. Few people seem to realize the high degree of heat in the vicinity of our ordinary heating appliances. A thermometer hung 12 inches above a hot-air register under very ordinary conditions reached 160° F. (71° C.), a temperature no blood element can withstand. Some protein is damaged at 108° F. (42° C.), and even red cells die at 158° F. (70° C.). Similar harmful temperatures are easily reached at the distance at which hands are held over a stove or in front of a fireplace or bonfire. Obviously, therefore, the defrosting agencies must have a temperature above freezing (32° F., 0° C.) and not above normal body temperature (98.5° F., 37° C.). There is some difference of opinion as to the optimum temperature to prevent disastrous interference with the circulation of the frozen part. It ought to be clear that if the vessels are occluded proximally to the part tissue death ensues regardless of our care of the distal portion. Now, so long as the frozen part remains attached to the body the blood stream will continue to work away at the proximal part at normal body temperature, and I know of no first-aid method to prevent it continuing to do so. If this heat is wrong, then the slower we defrost the outside, the longer the warm blood acts on the inside and the more harm is done, which is absurd. The grandmother, whom I knew, who snatched the child's hands away from the hot stove and placed them in her own ample bosom had the accumulated wisdom of the ages.

Let no one suppose that this is an attempt to deny the harmful effects of frost if deep enough and long enough continued. The circulatory stasis itself, with ischæmia and local tissue anoxæmia, the concentrating of cell constituents, and the electrical reactions about the melting crystals, all have undoubtedly damaging effects on the tissues, but these factors are already beyond our control. It is true, however, that flesh will withstand the milder grades of freezing with comparatively little damage *if we do not traumatize it or apply excessive heat.* Even the drunk who has lain out all night will lose less if handled carefully. Brooks (quoted by Perkins), states that temperatures considerably below –4° F. (–20° C.), roughly between 40° below zero F. (–40° C.) and –76° F. (–60° C.), are required to freeze the water in muscle completely.

Finally, it is important to remember that this devitalized tissue is particularly subject to infection. One of the prominent members of our own profession lost his life from tetanus after the guides had used mud packs on his frozen feet. The mud came from a stable!

Following defrosting, coolness will be found grateful to the victim, but this does not mean immersing the part in ice water. It is a physiological fact, according to Haliburton, that exposure to a low temperature depresses the constrictors more than the dilators. If a leg is placed in ice cold water hyperæmia occurs, and it is precisely this hyperæmia which we are seeking to avoid.

CONCLUSIONS

The profession should teach the following things about frost bite.

1. Be careful not to get it.
2. No rubbing, no massage, no movement of the frozen part, gentleness always.
3. No heat beyond that of a normal body; sources of artificial heat are to be kept at a very safe distance.
4. Remember the great danger of infection.

* Read at a meeting of the District of Beauharnois Medical Association, December 8, 1938.

PULMONARY EMBOLISM

By G. F. Strong, M.D.

Vancouver, B.C.

Sudden occlusion of a branch of the pulmonary artery makes itself manifest in several ways; notably, one in which a sudden large embolus occludes a main branch or the bifurcation (saddle embolus) of the pulmonary artery; another in which a smaller embolus causes a plugging of a smaller artery in the periphery of the lung with a resulting sudden pain, cough and hæmoptysis. The first of these may be the cause of sudden death, and is frequent enough during the second or third post-operative week to make it the bugbear of surgeons. The second is not so serious, and while it may, like the first, occur after operation, develops also in many medical conditions, especially in cardiac disease with auricular fibrillation. In this, the classic picture of pulmonary embolism, the result is too well known to need description here. Sudden, stabbing pleural pain, with an accompanying hæmoptysis, leaves little doubt as to the presence of a pulmonary infarct.

There is another type of pulmonary embolism, or, to put it more properly, there is another clinical picture, produced by sudden occlusion of a branch of the pulmonary artery that seems not so well understood. In this condition shock and dyspnœa seem to dominate the picture rather than pleural pain, cough and blood-spitting. This type of pulmonary embolism can be easily confused with coronary thrombosis, and since the treatment and prognosis are different it merits careful study. There is a well-recognized cardiac upset that follows occlusion of a pulmonary artery, the nature of which must be partly neurogenic, since the extent of pulmonary circulation affected is not sufficient to cause mechanical embarrassment of the right heart. This has been called by some *cor pulmonale acutum*, and produces a clinical picture of collapse, dyspnœa, tachycardia and cyanosis. The pain, if any, depends on the extent and location of the pleural involvement, and hæmoptysis may or may not occur.

The differentiation between coronary thrombosis and this acute cor pulmonale must be made on a basis of history, age, physical fitness of the patient, and other evidences of cardiac disease. As is well known, coronary thrombosis usually, though not always, occurs in a middle-aged patient with evidences of hypertension, angina or arteriosclerosis. In favour of the diagnosis of pulmonary embolism would be a young, previously healthy patient, the subject of a pelvic or abdominal operation, particularly where inflammation or trauma in the operative field had increased the likelihood of a regional phlebitis. In a coronary accident pain is more apt to be the prominent feature, whereas in pulmonary occlusion collapse and dyspnœa dominate the picture. Hæmoptysis when it occurs early is diagnostic of pulmonary embolism, though it must be kept in mind that a pulmonary embolism can occur as a late complication of coronary thrombosis. Fever and leucocytosis are usually present in both, and so are of no help differentially. A rub occurs also in both; in coronary thrombosis it is pericardial and synchronous with the heart sounds; in pulmonary embolism it is pleural in origin, and in either it may escape detection. It is probably possible to differentiate these lesions by means of serial electrocardiograms. The changes that usually occur in coronary thrombosis are well recognized and persist for a matter of several weeks or more, whereas the typical changes that have been described as occurring in pulmonary embolism persist for only about two days. From a practical standpoint the value of the electrocardiogram is not great, since it is only available to patients in hospital and many hospitals lack this facility. In those that have an electrocardiograph it is frequently not possible or convenient to secure a tracing in the acute stage of an illness so critical as either a coronary thrombosis or pulmonary embolism. Where possible the cardiogram should be secured by all means, but we should also school ourselves to make the differential diagnosis without such aid.

Treatment consists of early administration of sufficient morphia to ensure complete relaxation and rest in either case. In pulmonary embolism papaverine, ½ grain intravenously, may be of value. Oxygen by nasal catheter, or better by the more suitable *newer* masks, should be used where dyspnœa and cyanosis are prominent. It is in the duration of the necessary bed rest that the greatest difference between pulmonary embolism and coronary thrombosis occurs. In coronary thrombosis, as is well known, it is necessary to keep the patient in bed from six to eight weeks, while in pulmonary embolism the patient may be allowed up much sooner. Since pulmonary embolism is usually secondary to some other condition, either medical or surgical, it is usually the progress of the primary disorder that determines the duration of rest in bed.

The best treatment is, of course, prevention. In medical conditions the opportunities for preventive measures are much less than in post-operative states. It is now well recognized that the early resumption of normal respiratory activity after an operation is one effective way of lessening the danger of pulmonary complications. The use of carbon dioxide alone or in combination with oxygen during the post-anæsthetic period ensures a better degree of pulmonary ventilation. The encouragement of coughing at this early stage is also of value. Since many pulmonary emboli have their origin in a peripheral venous thrombosis the development of which is favoured by venous stasis the

early use of light massage and passive movements of the extremities is advisable. Change of position is also to be recommended for the same reason. Some surgeons have adopted the routine use of thyroid extract for their post-operative patients, on the assumption that the increased circulatory rate may help to prevent circulatory stasis. The work of the Toronto group on the intravenous use of heparin opens the fascinating possibility that we may be able to entirely avoid the danger of intravascular thromboses.

The prognosis of pulmonary embolism is always grave, and probably about one-half of all those suffering this vascular accident die. The prognosis in those who survive is fairly good. In this regard we again have an important point of difference between pulmonary embolism and coronary thrombosis. The outlook after a coronary thrombosis is always more or less uncertain, and many of these patients die from a recurrence of the coronary accident. The surgical patients who survive the initial stage of a pulmonary embolism, on the other hand, usually go on to complete recovery without much danger of another attack.

Clinical and Laboratory Notes

TRANSFUSION OF BLOOD BY AN OBSOLETE METHOD: USE OF CRILE'S CANNULA IN A CASE OF SECONDARY HÆMORRHAGE, IN 1910

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Toronto

The patient, M.A., aged 20, had been cut accidentally by an adze in the leg. He was admitted to the old Toronto General Hospital, by Dr. Noble, of Sutton West, on October 14th, 1910, with a transverse wound across the calf at the junction of the lower and middle thirds of the left leg.

On October 16th, although there was no hæmorrhage, pulsation was observed above the wound over a small area, suggesting the presence of a dissecting aneurism. He was prepared for operation on October 17th, but at four o'clock on the morning of that day he had a terrific hæmorrhage. This was controlled by a tourniquet.

A vertical cut was made through the gastrocnemius and soleus muscles, exposing the divided vessels and nerve. The ends of the nerve could not be brought together; the nerve, therefore, was split longitudinally for a short distance above the point of division and a segment sufficiently long to bridge the gap was turned down and secured in position by fine chromic catgut. The artery and the vein were ligated and the torn muscle sutured. Normal saline (oz. xxv) was administered by the median basilic vein.

The wound suppurated very freely after operation and at midnight on October 24th the patient had another severe hæmorrhage which saturated the dressings. As an emergency procedure Dr. E. S. Ryerson ligated the posterior tibial artery just below the lower border of the popliteus muscle. The patient was also given normal saline intravenously. He remained in a very anæmic state, with a blood count of 2,850,000 red cells and 40 per cent Hgb. It was determined to employ blood transfusion. His brother acted as donor.

The left cephalic vein of the recipient, just above the bend of the elbow, was utilized, and the left radial artery of the donor. Anastomosis was easily accomplished by Crile's method, using his special cannula; the vein was drawn through and cuffed over the cannula and the artery drawn over that. Transfusion was continued for 15 minutes. At the end of that time the recipient showed some slight signs of dilatation of the right heart, and became somewhat restless, with marked increase in respiration. The donor's pulse became weak and slightly irregular, and had increased in rapidity from 76 to 84. He complained of feeling hot and weak. The transfusion was then stopped. The radial artery in the donor was ligated and the cephalic vein in the recipient.

The channel in which the blood flows through the cannula is very small and hence the rate of flow was slow. The only method of determining the amount of blood transfused by such a method would be, as Crile suggests, that of weighing the donor, to a fraction of an ounce, before and after the transfusion. Crile's cannulæ were supplied in various sizes; the smallest was 1.5 mm. and the largest 3 mm. in diameter. I presented a set of these cannulæ to the Academy of Medicine of Toronto as a museum specimen.

The patient made a complete recovery. A notable feature during his convalescence was the fact that subsequent to the blood transfusion the suppurating wound rapidly assumed a healthy appearance; it healed completely without any further hæmorrhage.

The record of this case is of more than academic interest. The students of today are familiar with blood transfusion as a routine procedure where it is indicated. They do not realize that this most important therapeutic measure is very modern. Less than thirty years ago it was seldom employed, and I believe the case here reported was the first one of its kind in Toronto. Crile's method was later abandoned. My first case of transfusion by the syringe method was in October, 1914.

At No. 4 Canadian General Hospital in Salonika in March, 1916, Dr. E. S. Ryerson and the writer,

with Dr. B. P. Watson, demonstrated before the Salonika Medical Society the method of transfusion by means of the syringe. We got two convalescent patients and two reservoirs of coloured fluid, using rubber tubing affixed to each patient. We then carried out our demonstration in a very realistic fashion. Very few of the medical officers of the many British Hospitals in the district were familiar with it. Many, too, were skeptical of its value. In our unit we successfully employed transfusions in not a few cases. It will be remembered, too, that the late Dr. Bruce Robertson, of Toronto, was largely responsible for introducing transfusion of blood among British units in France during the early years of the war.

SPECIAL BIBLIOGRAPHY

1. ROBERTSON, L. B.: The transfusion of whole blood: a suggestion for its more frequent employment in war surgery, *Brit. M. J.*, 1916, 2: 38.
2. PRIMROSE, A. AND RYERSON, E. S.: The direct transfusion of blood in the treatment of the wounded in war (a paper read before the Salonika Medical Society, April 15, 1916), *Brit. M. J.*, 1916, 2: 384.
3. ROBERTSON, L. B., with note by C. Gordon Watson: Further observations on the results of blood transfusion in war surgery (36 cases of primary hæmorrhage in war are reported in this paper), *Brit. M. J.*, 1917, 2: 679.
4. PRIMROSE, A.: The transfusion of whole blood (editorial), *Brit. M. J.*, 1917, 2: 695.

Editorials

THROMBOSIS AND EMBOLISM AS EMERGENCIES

THROMBOSIS and embolism are serious matters. Thrombosis may lead to gangrene of the part involved, local and systemic infection, infarction and fibrosis, and is a potent cause of embolism. Embolism on occasion may cause sudden death, gangrene of an extremity, pneumonia, pulmonary abscess, hemiplegia and blindness. In both the final result is largely conditioned by the efficiency of the collateral circulation. All these facts are commonplaces of pathology but yet need to be kept in mind. Correct diagnosis and prompt action are essential to the proper treatment of these conditions. In most cases we are faced with an emergency.

One of the lesser emergencies is occlusion of the central artery of the retina, which is due either to embolism or spasm. It is lesser in the sense that it does not threaten life; it is, nevertheless, important as it threatens sight. Prompt recognition and treatment with one of the vasodilators are essentials. It is reported that good results have followed the use of papaverine hydrochloride.

One of the greater emergencies, in that it directly threatens life, is coronary occlusion, which is due to thrombosis in the lumen of a diseased and previously narrowed vessel, or, more rarely, to spasm of a healthy artery. The treatment is, at least at first, purely medical. The measures to be adopted are so well known that they need not be detailed here. Theoretically, vasodilators should be of service. A word of warning is that if papaverine is used its exhibition should be delayed until the first shock has been recovered from and the fall in blood-pressure has passed off. This is because of its action in lowering blood-pressure.

One of the ever-threatening bugbears of the surgeon is pulmonary embolism. So common is it and so dangerous that a consideration of preventive measures is even more in order than that of its treatment.

Donald C. Collins,[1] of Los Angeles, has published a valuable study of this condition. In 47,338 admissions into the Hollywood Clara Barton Memorial Hospital from Jan. 1928, to Jan. 1935, there were 34 cases of pulmonary embolism (0.072 per cent); 24 cases were met with in connection with 16,984 major surgical operations (0.14 per cent); only 10 occurred apart from operations; fractures accounted for seven. Nine were in males and 25 in females. Eighteen of the cases were fatal.

A lengthy list of predisposing factors is furnished by Collins. These are:—an incision into the anterior abdominal wall; varicose veins; obesity; advanced age; wound infection; trauma, usually in the form of comminuted fractures of the bones of the lower extremities; failure to immobilize fractures properly; hypotension; orthopædic operations; inadequate hæmostasis in an incision; the use of fat solvents in cleansing incisions preparatory to closure; the injection treatment of varicose veins of the lower

1. COLLINS, D. C.: Pulmonary embolism, *Am. J. Surg.*, 1936, **33**: 210.

extremities; diminution of intestinal peristalsis; stagnation of the venous return from the branches of the inferior vena cava; gout; anæmia; puerperal thrombosis of the pelvic or femoral veins; influenza; getting up too soon after an operation; faulty surgical technique; injury to vessel walls by trauma or infection; the increase of the prothrombin and coagulation time, so common after operations; endocarditis and myocarditis of the right side of the heart; and others.

Preventive measures are possible in most cases, and such can be deduced logically from the above-mentioned factors. We may cite;—the performance of operations with a minimum of trauma and absolute hæmostasis; minimizing intestinal paresis after operations; avoidance of extensive or unnecessary operations in the aged, gouty, obese, or anæmic person; prompt splinting of all fractures at the site of accident before moving the patient; the use of a tourniquet proximal to the site of an orthopædic operation on the extremities; avoidance of too tightly constricting surgical dressings on the abdomen; rigid asepsis at operations; prompt and thorough drainage of infected wounds; avoidance of active or passive movements of the lower extremities; the prohibition of pillows under the knees; heat to the lower extremities and to the trunk; the use of thyroid extract until the ambulatory period in all cases where no contra-indication exists, determining if your patient is "thyroxine-resistant" according to the method of Bankoff, and the administration of "ephetonin" and atropine sulphate after operation if he is; the routine treatment of all patients after operation by "sympatol", so successfully used by Fraundorfer;[2] the administration of "pitressin" to maintain intestinal tonus; and the employment of calcium gluconate both before and after operation.

Pulmonary embolism constitutes an emergency of the gravest character. In the 34 cases reported by Collins (*loc. cit.*) 18 deaths occurred, 13 of them within fifteen minutes to two hours. Obviously, in the majority of cases little can be done. If the patient survive until pain, shock and dyspnœa are somewhat relieved the use of some vasodilator can be considered. Collins (*loc. cit.*) records a case in which he used "Spasmalgin"-Hoffmann-LaRoche*, 1 c.c., intravenously within three minutes of the onset of symptoms with recovery, and states that he has treated 9 others in the same way with success. One patient died from a complicating bacteriæmia. If this treatment fails to relieve the condition promptly Collins advises that the patient be taken immediately to the operating room and the classical Trendelenburg pulmonary arterial embolectomy performed without delay. In view of the fact that pulmonary emboli are most commonly derived from the liberation of clots formed in the veins of the pelvis and lower extremities, to forestall such occurrence, which may mar the result of an otherwise brilliant operation, the inferior vena cava should be ligated just cephalad to the junction of the two common iliac veins According to excellent authorities (Wakefield and Mayo, Walters and Priestley, Pfaff) this is not a particularly dangerous procedure, either to life or the subsequent usefulness of the patient.

Fauvet and Monsaingeon[3] have described 16 cases of pulmonary embolism. Ten of the patients died; 3 immediately, before any form of treatment could be applied; 4 in a few minutes; and 3 after a longer period, during which various forms of treatment (atropine, morphine, adrenalin, ephedrin, injection of the stellate ganglion) had been tried without avail. Six patients were cured, 5 permanently; the sixth died in coma the day after apparent cure, without any further signs in the lungs. These authors state that they have had no experience with the Trendelenburg procedure.

Embolism of the larger arterial trunks of the limbs rarely if ever threatens life directly, but the danger arises from gangrene, infection, pneumonia, with all that these conditions imply. In the case of the lower extremity at least the emergency is urgent; in the case of the upper extremity, less so. The treatment of the former is eminently

* A 1 c.c. ampoule of "spasmalgin" contains papaverine hydrochloride, 0.021 g.; pantopon, 0.012 g.; "atrinol", 0.001 g. It is sometimes desirable to add more opiate if precordial pain is severe, and atropine to protract the antispasmodic action of the other drugs as long as possible.

2. FRAUNDORFER, R.: Beitrag zur Vermeidung der postoperativen Thrombose und Embolie, *Wien. klin. Wchnschr.*, 1935, **48**: 398.

3. FAUVET, J. AND MONSAINGEON, A.: Note dur quelques "embolies pulmonaires" graves, *Presse Médicale*, 1938, **46**: 1315.

surgical. The results largely depend on early diagnosis and prompt interference (embolectomy). Pearse[4], referred to by Graham[6], notes good results in 40 per cent of his cases operated on in the first 10 hours; in 14 per cent in the second 10 hours; and in 8 per cent in the third 10-hour period. It is evident that embolectomy is of relatively little value if carried out later than ten hours. The operation should only be carried out by an experienced surgeon and in an institution where all the necessary adjuvants can be obtained. Vasodilator drugs should promise some assistance, even in cases where it is intended to carry out embolectomy. Relaxation of the arterial spasm would allow the embolus to pass farther along the vessel and thus lessen the amount of limb that must eventually be removed. Denk[5], in 1934, was the first to treat patients suffering from various types of arterial embolism by the intravenous injection of papaverine hydrochloride. Six of 10 cases recovered. Denk thought that the results obtained in this way were as good as those obtained by embolectomy. He was the first, also, to suggest the use of this drug in cases of pulmonary embolism. Duncan Graham[6], of Toronto, in a useful article, advocates the injection of papaverine hydrochloride intravenously as soon as the diagnosis is made, to be repeated every six hours during the first 3 to 4 days. In the case of embolic occlusion of the upper extremity, where the prognosis is much better, this measure, plus the application of heat, is probably all that is necessary.

Heparin, purified and perfected by Murray and Best[7], of Toronto, promises well, both from experimental work on animals and from a few clinical tests in man. It would seem to have a place in the immediate after-treatment of operation cases, particularly in those where thrombosis and embolism are apt to occur, in the immediate treatment of embolism in the lungs and extremities, and in the prevention of recurrences. A.G.N.

4. PEARSE, H. E.: Embolectomy for arterial embolism of the extremities, *Ann. Surg.*, 1933, **98:** 17.

5. DENK, W.: Zur Behandlung der arteriellen Embolie, *Münch. med. Wchnschr.*, 1934, **81:** 437.

6. GRAHAM, D.: Embolism and thrombosis of the larger arteries; their diagnosis and treatment, *Canad. M. Ass. J.*, 1937, **36:** 33.

7. MURRAY, G. D. W. AND BEST, C. H.: The use of heparin in thrombosis, *Ann. Surg.*, 1938, **108:** 163.

VARIATIONS IN DISEASE

WE are apt to form our conceptions of various ailments from our observation of them during our own lifetimes and in our own localities. Hence, it may be, our judgments are too partial. For example, we do not always realize that certain diseases, if studied from the standpoint of their history, manifest at times striking variations in their intensity and changes in their distribution. With some justification such diseases may be compared with human beings; like them they are born, they develop, mature, decline, and die, the last stage, however, being in the case of disease unfortunately too infrequent. To attain proper perspective in this matter we have to study their developmental history, and such study will take us back generations, even centuries, rather than lifetimes.

It is perhaps idle to speculate when and how certain diseases originated. Possibly, in the case of the infections, bacteria at first innocuous have acquired pathogenic properties. Some have suggested, on the basis of cultural and experimental findings, that *Myco. tuberculosis* developed from the *B. smegmatis* or the timothy grass bacillus. That bacteria can manifest mutability is undoubted.

We would learn that infectious diseases particularly often manifest a sort of ebb and flow. Scarlet fever, for example, was very mild one hundred years ago; fifty years ago it had become malignant; at present it is again relatively mild. Influenza about forty-five years ago was severe; during the next few years it became much less prevalent, and was milder; the epidemic that arose after the World War was universal and devastating in its character. Diphtheria and small-pox have manifested similar variations.

History suggests that certain diseases are struggling to establish or maintain a footing. Such are cerebrospinal meningitis, acute

anterior poliomyelitis, undulant fever, and encephalitis. Some affections appear to be dying out, or, at least, are milder in their manifestations. Few nowadays see cases of acute articular gout, though the gouty diathesis may still exist in "masked" form as lithiasis, bronchitis, asthma or eczema. Chlorosis, prevalent forty years ago, is now almost unknown. Tuberculous lymphadenitis is rarer than it used to be. The disgusting manifestations of tertiary syphilis are practically never seen. The "Sweating Sickness" of the Middle Ages appears to be dead.

Diseases also seem to have narrowed their territorial domain in many cases. Scurvy, once endemic, even epidemic, in every land is now confined, at least in its major forms, to but few countries, though occasional cases may be met with anywhere, mostly in children, in forms which are apt to be overlooked. Typhoid fever is almost unknown in the larger cities, at least, of Canada. Malaria, yellow fever, typhus, bubonic plague, and leprosy have become more restricted in their distribution, for well-known reasons.

It will be seen that the diseases mentioned fall into two categories. Gout, scurvy, rickets, and chlorosis are largely dietary in character and bound up with personal habits; the remainder are microbic in origin and more dependent on communal hygiene.

Gout has been regarded as a metabolic disease due to defective handling of protein substances, based on over-eating and over-drinking. Readers of Pepys must have noticed the remarkable menus provided at certain banquets which he attended—six or seven kinds of fish, meats, poultry, game, ending with "subtleties", but little or no fruit or vegetables. Potatoes were obtainable, but probably expensive, and most of the vegetables with which we are familiar were unknown. Wines were freely used. It will be remembered that Pepys suffered from stone in the bladder. Later, we hear of the "three bottle men". With a better-balanced dietary and less alcohol gout is being "bred-out." The scarcity of vegetables, too, meant lack of vitamin C and the wide incidence of scurvy.

The influence of diet is also seen in certain other diseases, notably, rickets and tuberculosis. In 1870 it was stated that in London and Manchester about one-third of the children were suffering from severe rickets as shown by bow-legs, knock-knees and distorted bodies, while nowadays, though mild rickets still is met with, the severer forms are rarely if ever seen. Cod liver oil, calcium and phosphates in the food have wrought the miracle.

With regard to tuberculosis Woodwark[1] states that in the province of Salzburg, during and after the War, where milk, butter, meat and vegetables were relatively plentiful the death rate from tuberculosis showed, little change; in Vienna, where the food shortage was acute, people having to subsist on a diet that was both insufficient in quantity and poor in quality, the death rate was nearly doubled. Chlorosis, due to an insufficient supply of iron in the food or to faulty assimilation of the iron ingested apparently has been checked by improved habits of life—a better balanced dietary, more suitable clothing, more fresh air, more sunlight, more exercise, and greater attention to the bowels.

The microbic and parasitic diseases, while often acquired through faulty personal hygiene and environment, are more under the governance of public health measures. Modern public health institutions can largely prevent, control the course, and limit the geographical extension of many infectious diseases. Changes in the type and course of infectious diseases, are dependent, among other factors, on alterations in the virulence of the causative microorganism; on the development of immunity and a certain general resistance on the part of the host, the latter being in turn dependent on the extent of exposure, proper diet, housing, and personal good habits, and on the effectiveness of communal supervision of health matters.

It is well known that the *Coryn. diphtheriæ* varies considerably in virulence from time to time. Possibly, it was derived in the first instance from the harmless "diphtheroid". Allison (1932) in the case of nine convalescent diphtheria patients found a mutation in bacilli taken from their ears. In eight cases the virulent type of bacillus

1. WOODWARK, SIR S.: The rise and fall of certain diseases concurrently with the progress of hygiene and sanitation, *J. Roy Inst. Pub. Health & Hygiene*, 1938, **15:** 897.

changed to the avirulent, and in four there was an intermediate period during which both types were present The fluctuations in virulence noticed in the case of influenza are probably due to the development of a notable degree of susceptibility in the major epidemics affecting large bodies of people. Experiments with animals suggest the possibility that with the transmission of the virus from person to person its virulence may become enhanced As the most severely affected patients die off those who remain are immunized for a considerable time, but their immunity gradually dies out. Possibly, too, the fact that some of the newer infective diseases of the central nervous system, such as encephalitis, are gaining ground may be explained on the assumption that some micro-organisms which ordinarily merely attack the nasopharynx or gastro-intestinal tract, causing a simple catarrh, may be gradually developing the power of attacking the brain and spinal cord. Again, where infectious disease is only partially controlled by incomplete inoculation with vaccines and antisera a proportion of the population remains unprotected and may exhibit a variable susceptibility, depending in part on several extraneous circumstances. In these days of rapid transit, particularly by means of the aeroplanes, the insect vectors of disease and, sometimes, persons developing ailments that are common to tropical and sub-tropical districts may be brought to alien countries farther north. The diseases so occasioned are not likely, for well-known reasons, to maintain a footing, there, and may be modified by their development under the unaccustomed climatic conditions. Variations in disease, then, are due to many factors, some of which are known, others more or less problematical. A.G.N.

Editorial Comments

The Metabolism of Fat

The mechanism by which metabolism is controlled has not yet been clearly defined. That there is an intimate association between the thyroid and metabolism is of course clearly recognized, but it has for long been realized that the thyroid is not the only centre through which metabolic activity is controlled. It has been definitely shown by Collip and his colleagues that a metabolic stimulant is present in extracts of the pituitary, quite apart from its thyrotropic hormone. This stimulant has been proved experimentally in animals to increase the oxygen consumption and depress the respiratory quotient. There is increased CO_2 production, with rise in body temperature and some evidence of decreased nitrogen metabolism.

In view of these characteristics the theory has been advanced that this extract may be capable of stimulating the metabolism of fat, thus leading to reduction of weight. But the work up to this point had been done entirely in the laboratory. We now publish results of the clinical trial of this type of pituitary extract (see p. 105 of this issue). These show clearly that it is possible in human beings to raise sharply the basal metabolic rate, with corresponding increase in oxygen consumption, exactly paralleling the effects in animals.

We look for further clinical tests along these lines. They give promise of great advance in the difficult problem of weight-reduction. H.E.M.

The Canadian Journal of Medical Technology

A new journal is before us. It is *The Canadian Journal of Medical Technology*, the official organ of the Canadian Society of Laboratory Technologists. The first number appeared in October, 1938. The Managing Editor is Dr. H. A. Peacock, of Hamilton, Ont., and the Associate Editors are Drs. A. D. Kelly, Toronto, H. A. Ansley, Toronto, the Misses B. M. Forcade, Calgary, Alta., E. Siekawitch, Moose Jaw, Sask., M. Main, Hamilton, and M. Girvan, Montreal. The Secretary is Miss A. M. Graham, General Hospital, Hamilton, and the Treasurer is Miss Helen Smith, Dominion Treasurer, Hamilton.

Some idea of the scope of the publication may be obtained from noting the titles of the articles contained: Routine Tissue Diagnosis by "A Modified Frozen Section Method" by H. A. Ansley; The Dewar Flask as a Constant Temperature Water-Bath, by A. Barber; New Stain for Leucocytes, by Sister M. Liquori; The Laughlen Test for Syphilis, by L. Sullivan; The Cultivation of the Gonococcus, by J. M. Hutcheson; An Autopsy Stand for Mice, by J. M. Hutcheson; A Method of Mounting Electrocardiograph Films, by E. Glaesner; Notes on Technique; and Questions on Technique. Reports of the first Annual General Meeting of the Canadian Society of Laboratory Technologists, held in Hamilton on December 11, 1937; of the first Annual Business Meeting; of the Dominion Secretary; and of the Saskatchewan Branch follow.

The new journal presents a very tasteful appearance. It is printed on good paper by the Hunt Printing Studio, Medical Arts Building, Hamilton, Ont., and the pages are amply margined. It is a credit to the organization which it represents. Membership in the Society, including the journal, is $3.00 active, and $1.00, associate. A.G.N.

Special Articles

DIET AND NUTRITION

THE NUTRITIVE VALUE OF CANNED FOODS*

BY L. B. PETT, B.S.A., M.A., PH.D. AND

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XII.

In ancient times man met the need for preserving foods by smoking, drying or salting. In modern times new methods have been developed, using low temperatures (freezing, refrigeration) or high temperatures (boiling, canning). By canning we mean the heat-processing of food in closed containers. Although Spallanzani had shown in 1775 that meat broth could be preserved if heated in corked glass bottles it is Nicolas Appert who is considered the founder of modern canning. Stimulated by problems arising from the Napoleonic wars, Appert succeeded from 1800 to 1810 in preserving a wide variety of foods by heat-processing in corked flasks. From 1810 to 1840 the tinned iron container was developed in England and introduced to America, and home-canning also began. About 1878 the pressure cooker was first used, permitting heat-processing at higher temperatures than boiling. From 1900 to 1910 automatic machinery was introduced, and commercially canned foods began to be used commonly.

THE CANNING PROCESS

The idea is essentially the same in home and factory. Some selection of the raw material is made, followed by cleansing. Almost all products receive some heat treatment before being put in containers. This may vary from a light scald or blanching to prolonged boiling. Filling, along with a syrup or brine, is then carried out into sterilized containers. This may be done while hot, and the container may be sealed at once or later. Subsequent heating for a final sterilization is usually performed. Commercial canning has the advantage over home canning in the last steps, because all air can be driven out, and subsequent heating of the hermetically sealed can is more easily carried out.

The old objections to cans as containers are invalid. While occasionally considerable quantities of tin, iron and lead (from solder) have been reported in the contents, this is not a frequent occurrence, and has never clearly been the cause of trouble. There is, further, no experimental reason for not temporarily leaving the contents in the can—which is likely to be the most nearly sterile dish in the kitchen.

NUTRITIVE VALUES

Only in recent years has any concern been expressed about the food values of the canned product, and the industry itself is very active on this point. Unfortunately raw materials, even of the same grade, vary greatly in composition. Then, too, the canning process affects variably the same constituent in different foods, and different constituents in the same food. General statements are therefore difficult to make, and often unwarranted. The only safe procedure in evaluating a food stuff is the use of analyses of raw, cooked and canned samples. Such analyses show the range of values possible and the losses that have been found.

The table with this paper presents all such analyses that have been found and considered reliable, but it is very incomplete. The term "pulped canned food" is introduced to indicate food which has been comminuted, especially by forcing through fine openings. Essentially the same analytical results are indicated by such terms as strained, sieved, puréed, and homogenized. A few general comments may be derived from the table.

THE STABILITY OF VITAMINS UNDER CANNING

Vitamin A, being fairly stable to heat in the absence of air, is only slightly destroyed by canning; the losses vary from 10 to 50 per cent, depending on the product concerned, and are the same in home or factory.

Vitamin B_1 is appreciably destroyed in all cooking and canning. Acid products preserve it best—the loss being 5 to 15 per cent, but in alkaline 80 per cent may be lost.

Vitamin C is the least stable of all vitamins, but owing to the occurrence of precursors or

* From the Department of Biochemistry, University of Alberta, Edmonton.

This is the twelfth in the series of articles on Diet and Nutrition, prepared under the auspices of the Association's Committee on Nutrition. The previous articles can be found in the Journal, 1938, **38**: 277, 387, 491. 586; **39**: 76, 179, 280, 389, 483, 578; **40**: 77.

TABLE SHOWING AVAILABLE ANALYSES OF RAW, COOKED AND CANNED FOODS, WITH RESPECT TO VITAMINS A, B_1, C, D, G, CALORIC CONTENT, CALCIUM, PHOSPHORUS, AND IRON

All figures are for 100 grams, or about 3½ ounces, of edible portion, regardless of the water content. Vitamins A, B_1, D are in International Units; vitamin C is in milligrams; vitamin G is in Sherman-Bourquin Units. Minerals in grams. "Pulped" refers to finely divided food. The figures are chiefly from publications by the United States Government and the Medical Research Council of Great Britain, and numerous calculations from original papers.

Foodstuff	*Vitamins*					*Calories per 100 g.*	*Ca percentage*	*P percentage*	*Fe percentage*	*Approximate measure of 100 g.*
	A Int. Units	*B1 Int. Units*	*C mg.*	*D Int. Units*	*G Sherman Units*					
Daily requirements										
Child	2,000- 6,000	200	5-15	200-600	?600	1,500-4,000	1.00	1.00	0.015	
Adult	6,000-15,000	300-500	10-50	?300	?600	1,800-5,000	0.70	1.30	0.015	
Apples:										
Raw	0-119	7-10	0-10		10-20	60-125	0.004-0.007	0.007-0.012	0.0003-0.005	2" diam.
Cooked			0.5			124	0.002-0.009	0.008-0.015	0.0016-0.004	½ cup
Stored	0		0.2							
Canned	0		0-2			40-60				
Canned, pulped			0			60	0.012	0.019	0.0014	
Apricots:										
Dried	5,000-8,000	9-44	0-25		40-125	200-300	0.066-0.100	0.117-0.118	0.004-0.008	25 halves
Dried, cooked	1,000-2,000	0-30	0			128	0.018-0.050	0.032-0.060	0.002	4 halves
Canned, whole	3,000-5,000		0			40-130			0.009	6 halves
Canned, pulped			0			60	0.012	0.019	0.0014	⅓ cup
Asparagus:										
Green	500-1,000		1-40			22	0.025	0.039-0.600	0.001	7 stalks, 5 in. long
Bleached	0									
Cooked			0-25							
Canned			1-40			20-30	0.105-0.254	0.60-0.82	0.010-0.001	
Beans:										
Dried, white		40-100	0-1		10-30	330	0.161	0.484	0.007	½ cup
Canned, white or baked						128	0.062	0.184	0.002	
String, raw	400-1,000	15-40	1-12		25	30-40	0.046-0.085	0.052-0.318	0.001-0.006	¾ cup
" cooked			0-5				0.019	0.046-0.100	0.0017-0.0024	
" canned		5-15	0-4		25					
" canned, pulped	7,000-10,000	10	0-3		20	25	0.052	0.031	0.001	⅓ cup
Lima, dried	0		10-15		100	350	0.071	0.338	0.009	¾ cup
" canned		35	5-6		100	70			0.002	¾ cup
Soy, ground	400	100-700	0		900	400-417	0.200	0.450-0.580	0.0007	½ cup
Beets:										
Raw	0-15		5-20		40-50	40-50	0.029	0.039	0.0009	2 of 2" diam.
Cooked			2-8							
Canned		5	5			40-50				
Canned, pulped		3	3-4			30-40	0.017	0.037	0.0016	
Beet greens:										
Raw	10,000		30-40		250	27			0.003	
Broccoli:										
Raw	1,000-10,000	30-60	15-60		100-400	32	0.22	0.070	0.0014	
Cooked	300		20							1 cup
Canned		17			100					
Cabbage:										
Raw	0-100	40-60	15-40		30-60	20-30	0.045	0.029	0.0004	1 cup, chopped
Cooked			2-30			8	0.042	0.027	0.0003-0.0006	
Canned					7					
Carrots:										
Raw	1,000-7,000	20-80	1-7		30-60	40-50	0.056	0.046	0.006	3 - 6" long
Cooked			1-8			24	0.007-0.040	0.004-0.018	0.0004-0.002	
Canned, pulped	6,000-7,000	10			7	30	0.029	0.029	0.001	⅓ cup
Cauliflower:										
Raw	40-50	110	6-40		50-60	20-30	0.123	0.061	0.0009	1 cup
Cooked	10-20	22	0-30			10-15	0.023	0.033	0.0005	
Canned						20				

TABLE—*Continued*

Foodstuff	*Vitamins*					*Calories per 100 g.*	*Ca percentage*	*P percentage*	*Fe percentage*	*Approximate measure of 100 g.*
	A Int. Units	*B1 Int. Units*	*C mg.*	*D Int. Units*	*G Sherman Units*					
Celery:										
Raw	0-1,000	10-20	3-6			10-20	0.050-0.078	0.032-0.037	0.0006	3 - 6" stalks
Canned, pulped						10-20				
Cherries:										
Raw	100-500		3-20			50-80	0.015-0.019	0.016-0.031	0.0004	20 cherries
Canned			2-5			40-70			0.0012	
Corn, yellow:										
Raw	100-1,000	100	3-10	0		100	0.006	0.103	0.0005	2 - 6" ears
Cooked			2-5							
Canned	1,000	30	8			80-100			0.0005	2/5 cup
Cranberries:										
Raw	20	0	8-30	0	0	50	0.017	0.011	0.0004	1 cup
Canned			3-5			180				
Grapefruit:										
Raw	0	14-40	2-50		40	30-50	0.017-0.021	0.016-0.020	0.0002-0.0003	½ cup of ½" pieces
Canned	0-15	2	30-40		5	30-60				
Grapefruit juice	0		2-65			20-30				¼ cup
Canned			30-40			50				
Lemon juice	0		20-70			10-40	0.008-0.024	0.010	0.0002	½ cup
Canned			46			20				
Milk:										
Raw, whole	100-400	20-30	1-3	0-10	50-100	69	0.120	0.093	0.0002	⅜ cup
Condensed (sweetened)			0-2			330	0.300	0.235	0.0006	⅓ cup
Evaporated	500	23	0-1	27	200	130-150	0.250	0.200	0.0005	⅜ cup
Irradiated	200-300			270-500						
Oranges:										
Raw	65	60	10-60		20-40	40-60	0.045	0.021	0.0005	2" diam. (No. 288)
Canned	40		40			40-60				
Orange juice	60	20-30	10-80		30	40	0.012-0.029	0.016-0.024	0.0004	½ cup
Canned			30-50			50-70				
Peas:										
Dried	200-1,000	140	0-10		90	300	0.033-0.084	0.268-0.400	0.005-0.0057	½ cup
Raw	400-2,000	40-300	4-40	0	100-200	100	0.015-0.028	0.104-0.127	0.0019-0.0021	¾ cup
Cooked			0-14			120	0.012-0.026	0.021-0.083	0.0004-0.0016	
Canned	1,000-10,000	40-75	5-13		100	40-60	0.020	0.080		½ cup
Canned, pulped	9,000-11,000	25-30	3-4		29	50-60	0.012	0.083	0.0016	⅓ cup
Peaches:										
Raw, with stone	50-1,000	3	1-8		18	40-50	0.005-0.016	0.019-0.024	0.0003	2½" diam.
Canned	200	0	3-4			30-40			0.0011	
Pears:										
Raw	0-20	10-40	1-5		20-100	40-60	0.007-0.015	0.010-0.026	0.0002	1 large
Canned	10	1	3			30-80			0.0007	
Pineapple:										
Raw	10-100	25	5-30		20	40-60	0.018	0.008-0.028	0.0004	1 - 1" slice
Canned	40-100	20-80	5-10			50-100			0.0001	
Pineapple juice:										
Canned			5-20			60				½ cup
Prunes:										
Dried, cooked, with stones	500-1,500	10-50	0-1		10-100	80-130	0.015	0.030	0.0008	4 prunes
Canned	1,000	3	0		5	80-130				⅓ cup
Salmon, canned	100-400	10-30		200-800	80	150-200	0.024-0.075	0.250-0.320	0.0008-0.0016	¾ cup

TABLE—*Continued*

Foodstuff	*Vitamins*					*Calories per 100 g.*	*Ca percentage*	*P percentage*	*Fe percentage*	*Approximate measure of 100 g.*
	A Int. Units	*B1 Int. Units*	*C mg.*	*D Int. Units*	*G Sherman Units*					
Sauerkraut.....	0	20	0-10		20	20-30				⅔ cup
Canned.....	0-100	20	0-1			20				
Sardines, canned..	100-10,000	30		1,000-5,000		200-300	0.025-0.409	0.260-0.683	0.004	10 sardines
Shrimp, canned...	1,000	0-40		100-500		111	0.028	0.292	0.0027	20 shrimps
Spinach:										
Raw.....	600-700	12	10-80		20					
Cooked.....	1,000-28,000	50-60	0-12	0	40-150	22-30	0.060-0.560	0.020-0.100	0.0026-0.0036	⅔ cup
Canned.....	5,000-15,000	2-10	5-7		7	10-20	0.062	0.026		
Canned, pulped..	12,000	4-6	7-9			20	0.057	0.039	0.001	½ cup
Strawberries:										
Raw.....			20-70			36	0.022-0.041	0 023-0.028	0.0007	½ cup
Canned.....	20	4	25			30-50				
Tomatoes, red:										
Raw.....	500-1,000	20-60	15-35		12	20	0.011	0.026	0.0004	2" diam.
Cooked.....	500		0-20							
Canned, whole...	100-1,200	20	5-22		10-15	20			0.001	½ cup
Canned, pulped..	2,000-5,000	25-45	5-11		21	20-40	0.013	0.030	0.0016	
Canned, juice....	1,000-5,000	11	0-25		15	20-30	0.005	0.017	0.0008	½ cup
Canned, soup....			9			50			0.0022	
Turnip greens:										
Cooked.....	1,500-10,000	30-50	20-100		100-200	32	0.098-0.347	0.045-0.049	0.0035	¾ cup
Canned.....		3	10		5	20	0.170	0.050	0.0014	

combined forms it is quite stable to canning in some foods; in other cases it is completely destroyed.

Vitamin D is fairly stable in milk; it is not important in most other foods.

Vitamin B_2-complex is quite stable to heat. Riboflavin and nicotinic acid are destroyed in canning only to the extent of 5 to 20 per cent.

LOSS OF MINERALS IN CANNING

Calcium and phosphate precipitate during the canning of many foods, and the precipitate is lost because it settles out, or adheres to the metal, or is insoluble in the gastro-intestinal tract.

Iodine is lacking in canned foods, except sea foods, because canning districts are usually in goitre belts.

HOME-COOKING

Most canned foods must again be heated in the home. The wise advice that this be done in the can is rarely followed, and further losses are certain to occur, mostly from oxidation.

CONCLUSION

The high standard maintained by manufacturers in selecting and handling the raw materials suggests the superiority of canned products over the poor grades of raw products. Nevertheless, it is best to refer to actual analyses showing observed losses of the particular food constituent under consideration. Since many canned foods must again be cooked in the home, further losses from the stated values will be observed. This fact tends to bring the food value of canned foods even lower than raw foods, which receive only one heat treatment. In such cases canned foods may sometimes be justified on grounds of convenience or price rather than on their food value.

SOME ASPECTS OF DAY-DREAMING*

BY H. R. BRILLINGER,

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It is by no means an uncommon experience for most practising physicians to find themselves confronted with a worried mother who is eager to know the reason why her child is failing in his school work, or failing to show the normal liveliness of others of his own age. In many of these cases the mother speaks of "day-dreaming spells". Others complain that for longer or shorter periods the child will sit with a preoccupied manner, often staring vacantly into space, and possibly grimacing or smiling to himself, when he is supposed to be concentrating on some task or activity, or even when supposed to be listening to the radio or reading. They may note that the child must be spoken to repeatedly or even loudly at such times and that he will give

*A paper presented to the Hamilton Medical Academy.

a start as though waking up before answering. They may report that the child seems to prefer sitting alone in this manner at times rather than taking part in the activity of other children. This is the condition called "day-dreaming", and in its exaggerated form it causes family concern and alarm, and rightly so, for a child who spends much of his time in this manner is mentally ill and often physically ill. The parents are wise who seek medical aid early, and the physician is wise who takes a serious view of the case and seeks to understand it and remedy the abnormal conditions which are its cause. It is with the hope of offering some suggestions regarding a few of the causes and the treatment of this condition that the present paper is presented, based on a few outstanding cases that have come to my attention in the Hamilton Provincial Mental Health Clinic.

DAY-DREAMING ESSENTIALLY NORMAL

Robert S. Woodward,[8] in his text book of Psychology, describes day-dreaming as a sort of play. This is an apt definition if one adds that the toy employed in the playing is one's imagination, and that this toy is usually played with alone. Hence one might say—"Day-dreaming is the solitary game of imagining." It is essentially an activity of the normal mind and is most common in youth. In fact it may be regarded as a sign of mental growth and development, and is first manifested at an early age. Every normal child day-dreams to some extent. When, however, the day-dreams become so fascinating that he prefers them to playing with other boys and girls of his own age, that is the danger signal, the sign of abnormality. Then it is that the child is beginning to give day-dreaming a too important place in his life. Indeed, day-dreams often have a very useful function in the life of the child as well as in the life of the adolescent. They frequently act as a spur to greater effort. It is a good thing for an individual with a goal, especially for the adolescent, to experience the genuine pleasure obtained from picturing his goal as realized, always providing that he preserves the sense that it is not so, and that he does not act as if it were realized, and cease to work for it.[4] In fact I would encourage more day-dreaming in our youth of today, as so many of them seem to be growing up without any definite visions of, or goals for, their future. This is often true of our delinquents.

ABNORMAL DAY-DREAMING

The day-dreamer is seldom a delinquent, but he is frequently reacting to the same stimulus, namely, a feeling of inferiority.[1] The type of reaction depends on the type of child, and Thom[1] maintains that there is a day-dreaming type of child. Groves and Blanchard[3] regard day-dreaming as characteristic of the seclusive or shut-in type of personality, but it is by no means confined to this type, although it is probably in this group that it most readily becomes exaggerated and abnormal.

In studying their abnormal manifestations it is interesting to note the manner in which such day-dreams often originate. Let us visualize a child doing writing exercises at school, for example. At first his whole attention is necessary for the task, but as the process becomes mechanically more perfect the child's attention is not so much needed for the carrying out of the instructor's requirements and it demands another sphere of interest. Perchance he hears the buzz of an aeroplane and tries to see it. But this may interfere with his work, and a reprimand from the teacher curtails his physical efforts but not his thoughts, and so he imagines what it is like, where it is going, and, finally, that he is in it, to his great pleasure. It will readily be seen that the bright child, who becomes proficient at his task before the others and must wait for them to catch up, has ample opportunity for this mental imagery. On the other hand, the handicapped or retarded child who is trying to do tasks beyond his capacity and is failing day after day soon learns to make only the motions of trying while enjoying successes in the realm of dreams. The sign of his day-dream of success will be seen in the smile that passes over his face as he sits supposedly performing his assigned task.[5] It is in this way that the thought habit of day-dreaming is constructed, a habit strongly linked with pleasurable emotion, and completely unrelated to any mechanical activities that may be going on at the same time. It should be noted that these thought habits in no way assist the subject in his adjustments to his immediate environment. Indeed, there is grave danger that day-dreams will hinder the child's "outward adjustments". It must be understood that they always fulfill his desires, and that without the necessity for an unpleasant effort on the part of the individual. Of course, it is only make-believe success; but if real success is denied him, or is too difficult to get, or too slow in coming, the make-believe success is often accepted in its place. In other words day-dreaming is a substitute for action. Thus, insidiously, the daydream-success-habit becomes established, and as it does so the dream world becomes more real, because more commonly used, and the world of reality becomes more unreal or unnatural, because less often used. It is in this manner that day-dreams become delusions and mental illness replaces mental health.

It is in this connection that we speak of "the split-personality"—the habitual day-dreamer having two different personalities as it were. In his external life, or life of contact with reality, he is a failure, a nobody, and a peculiar individual; but in his dream-life he is a success, a hero and a lauded individual. Thus, because of its tendency to supplant effort and so to predispose to failure in the life of reality—upon which failure it grows—and because of its tendency to cause

splitting of the personality and mental illness we must keep a watchful eye on day-dreaming to see that it does not outgrow its usefulness.

THE CAUSES OF DAY-DREAMING

We have pointed out that day-dreaming is a normal mental activity, but one that is prone to outgrow its usefulness and cause abnormal manifestations, and we have urged that a watchful eye be kept upon it. Perhaps it would be well now to consider under what circumstances one might expect to find day-dreams most readily getting out of hand, or, in other words, the causes of day-dreaming. In this connection Morgan[7] mentions three that he considers outstanding—frustration, loneliness, and fear; while Thom[1] considers that day-dreaming is one of the four methods used by those with inferiority feelings to overcome their difficulties. To my mind, however, the cause is only to be discovered by observing what is accomplished by the dream.

Perhaps the most common day-dream is one in which the individual is successful and is obtaining praise and honour. Obviously, the cause in these cases is frustration and lack of success and praise, and the remedy is to provide an adequate amount of both for the individual.

Some people have a tendency to imagine fearful situations which stand between them and the object of their desires. These are seldom helped simply by attempts to explain away the fears. What they also need is success.

Loneliness will cause day-dreaming and imagined playmates are to be preferred to complete inactivity. When, however, the child begins to imagine the presence of playmates it is the warning signal that real playmates should be provided as soon as possible.

The taboos that are placed upon sex by custom and law[5] and the shame attached to it are responsible for the multitude of sex day-dreams indulged in by adolescents. By it they escape the restrictions that hamper their inner desire. The remedy is to provide our youth with adequate sex knowledge and opportunities for unhampered discussion of their difficulties.

How frequently, too, the day-dream is used as a means of "getting even". Have you ever noticed how much easier it is to forgive a person after you have punished him and humiliated him in imagination, even if this takes the form only of expressing your feelings as to what should be done to him? These dreams are a compensation for our feelings of inferiority. They are necessitated by the fact that we must preserve our dignity or feeling of importance. The more insecure we feel this to be, whether consciously or unconsciously, the more we will tend to react to slights by day-dreams of revenge.

CASE DISCUSSIONS

A study of day-dreaming will soon convince one that each case must be considered individually both as regards cause and treatment. This is illustrated by the following cases which came to our attention in the Hamilton Provincial Mental Health Clinic.

CASE 1

M.E., is a 9 year-old girl who was brought because of day-dreaming, lack of concentration, and retardation at school. This child is the younger of two children of English-Irish stock. Her family history is positive for neurotic tendencies, the mother and maternal grandmother having been "nervous" all their lives, and the father being a shell-shock case. Her birth was premature, but her early development was normal and she was considered quite a normal child in every way until about two years before consultation when she began to show day-dreaming and lack of concentration in her school work. In spite of urging by her teacher and her mother who stated that the teacher had "a pick" on her child, she failed to pass at the end of the term, whereupon the mother rose up in wrath and demanded that she be promoted. The child was consequently placed in the Junior Third, where her day-dreaming and failure increased to such a degree that the teacher (a cousin) became alarmed and requested that she be referred to the Clinic. On examination she was found to be of normal intelligence, but it was noted that she was almost two years advanced in school for her mental age. It was evident that the child was attempting work quite beyond her ability, hence the failure. Moreover she was 8 lbs. underweight and had greatly enlarged and chronically infected tonsils. It is interesting to note, too, that a chiropractor had said that her head was at the wrong angle of her body due to her having been shaken by the former teacher. Undoubtedly, however, she was neither physically nor intellectually equal to the extra strain and so she was failing and was compensating by what was called "nervousness" and by day-dreaming.

The treatment was first to get her under the care of her family physician, and then to warn the mother to stop pushing her. The teacher was seen and was asked to give her special care, with easier work and plenty of praise and success. It was suggested that she be prepared to remain two years in her present grade. We have reason to believe that this normal child, whose day-dreaming was due to being pushed beyond her ability, is now adjusting nicely.

CASE 2

C.R., was a boy of 13 years and 6 months when first seen by the Clinic. He was brought with the complaint that he was day-dreaming and generally gloomy, and was making no progress in school being still in the Senior First class. He was the fifth of six children of English-Scotch parentage. The father was an unemployed farm labourer and the mother was a domestic before her marriage. Of the boy's four older siblings only one had passed the entrance and all worked as farm labourers and domestics, and the younger sibling was only in the Junior First at the age of ten. The subject was making no progress in school and his teacher described him as slow, quiet, slovenly, easily led, day-dreaming and generally gloomy. Psychological examination showed him to be of upper moron intelligence, with a mental age of 8 years and 7 months and an intelligence quotient of 64. Physically he was normal, except for uncleanliness, bad teeth, myopia, and external strabismus. He complained of difficulty in seeing the board. Psychiatric examination showed him to be a sulky, dull-expressioned lad who was very slow of comprehension, and was still slower in answering questions. His lack of ambition and lethargic manner were outstanding, and he could not be stimulated to show marked interest in anything. He was obviously living in a dreamy state quite apart from realities. In short, he was a boy of 13 with a mental age of 8 who had been striving for 5 years to do work he could only now be expected to do, and who was still failing because of poor eyesight and bad habits of application. Is it any wonder he had had to retreat into day-dreams for his successes and happiness and had become sulky and gloomy?

The treatment, of course, was to correct his sight, institute better hygienic habits, and place him in an auxiliary class for special instruction. There a special course would be arranged for him in which he would attain success, and would receive praise for real success, and therefore, would not need make-believe ones.

CASE 3

G.H., an 11 year old girl came to Clinic because of day-dreaming to the point of talking to herself and acting queerly when alone, soiling herself, and playing with her excreta (smearing it over her toys and on the wall), masturbation, exhibitionism (appearing nude before her boy cousin), lying stealing, and school retardation (in the Junior Second at 11 years). Now what more would you want? She was brought by an aunt with whom she had lived for four years and who was definitely antagonistic toward her; perhaps because payments for her had been stopped by her other aunts who had promised them, the child being an orphan. The subject was a twin and only living child. Two previous siblings were stillborn and the mother died, when subject was 4 years old, of Addison's disease. The subject's father was a Barnardo Home boy and was a farm labourer of low mentality and questionable morals. From 4 years of age the child has been passed from relative to relative and has also lived in boarding homes. In the present aunt's home she was teased and tormented by a bright boy cousin who was also held up as an example to her. She reported that she was constantly in fear of his pouncing upon her to hit and pinch her, and she jumped at the least move of the examiner. She was very unhappy. One of her homes had been with undesirable people and it was there she learned her sex habits. Her poor school progress was due to mental deficiency, her mental age being 7 years and 8 months and her intelligence quotient 70.

Here was a child who was showing marked signs of mental ill-health of a schizophrenic nature, with seclusiveness, peculiar behaviour, and marked day-dreaming. The cause, of course, was her abnormal and unhappy environment, with failure and criticism everywhere. She lacked sympathy and love and friends. The treatment consisted of removing her from the home. She was placed in a foster home with another girl of her own age and she now goes to a country school. The educational problem is not yet adjusted but she is happy, active, and doing well. Her behaviour problems have all completely disappeared, and she no longer day-dreams. She is well on the way to mental health.

CASE 4

J.L., was brought to the Clinic at 9 years of age because of morose, sullen, day-dreaming spells during which she had the peculiar habit of disposing of her bowel excreta. Usually a happy, pleasant, though reticent, child, who enjoyed playing with other children, she would take spells of seclusiveness during which she sought to be alone, was sullen, day-dreamy, and irritable. At such times she refused to use the toilet but secretly evacuated her bowels and hid the exreta, wrapped in towels or handkerchiefs, under her pillow or the mattress, or in cupboards, dresser drawers, or anywhere. She was an only child. The parental stock was English, and both parents were well educated. Her birth was normal, but four day afterward her mother became mentally ill and spent a year in a mental hospital. During this time she was cared for by foster parents and she was returned to her parents with complete bowel control established. Seven weeks before her examination she was returned to the foster mother because her mother had again become acutely ill mentally and had been returned to the mental hospital. Her peculiar behaviour was soon noted and advice was sought. The child had no explanation to offer for her habits, but she shyly admitted them and promised to do better. Frequent relapses occurred however. It was ultimately learned that her mother's toilet habits in the hospital were similarly peculiar, and it developed that the child's outbreaks always followed a visit from her father, who continually talked to her of soon returning home to her mother. The child with tears informed me that she feared her mother and did not wish to return to her. It seemed apparent, therefore, that the cause of the day-dreaming spells was a conflict between her love for and fear of her mother. The spells were an imitation of the psychotic mother when the subject was made unhappy by the fear of returning to her.

The treatment was to discuss the matter with the father, limit his visits and change his manner of approach to the child. This, with the institution of a daily "habit time" routine of elimination proved effective, and she recovered completely. Recently, however, she has again been taken home by the parents, the mother having returned from the hospital. We have heard since that the subject has relapsed into her old habits and her parents refuse to return her to the Clinic.

Many other cases could be mentioned, but time forbids, nevertheless, I would like to draw your attention very briefly to one other case that illustrates a point in the differential diagnosis of day-dreaming.

CASE 5

W.W., was a boy of almost 6 who was brought by his mother because of peculiar behaviour which she called stubborn day-dreaming spells. She complained that frequently when asked a question he would refuse to answer, or when given a command he would ignore it. At such times he was want to turn his head away and stare straight ahead of him for a few seconds and then carry on as if nothing had happened. His teacher and even my psychologist complained of him likewise, and yet noted that at other times he answered readily and was most obedient. But in my office the boy took four typical petit mal epileptic seizures, and undoubtedly these were the day-dreaming spells that the mother was concerned about.

CONCLUSION

In conclusion I would like to say that day-dreaming is normal but it readily becomes abnormal, and when it does so it is always a sign of early mental illness. Moreover it has been our experience that when treated early the results are usually very gratifying.

REFERENCES

1. THOM, D. A.: Everyday Problems of the Everyday Child, Appleton, New York, 1931.
2. *Idem*: Normal Youth and Its Everyday Problems, Appleton, New York, 1932.
3. GROVES, E. AND BLANCHARD, P., Mental Hygiene, Henry Holt, New York, 1930.
4. WELLS, F. L.: Mental Adjustments, Appleton, New York, 1928.
5. GROVES, E. R.: Personality and Social Adjustment, Longmans, Green & Co., New York, 1931.
6. JERSILD, A. T.: Child Psychology, Prentice-Hall, New York, 1935.
7. MORGAN, J. J. B.: Child Psychology, Farrar & Rinehart, New York, 1934.
8. WOODWARD, R. S.: Psychology: A Study of Mental Life, Henry Holt, New York, 1921, p. 493.

Men and Books

AN ACCOUNT OF AN OBSTETRICAL PRACTICE IN UPPER CANADA

(WITH A REPORT OF 1,828 CASES)

BY MELVILLE C. WATSON, M.B.

Toronto

Walter Horatio Burritt* recorded his inclination to specialize in the art of obstetrics early in the year 1835, by commissioning Rufus Collins, a blacksmith in Smith's Falls, to fashion a pair of obstetrical forceps for his future use. The possession of this part of the doctor's equipment must have been one of his early cares, because it was only in July of the same year that he was found to be "well qualified to practise", by the Upper Canada Medical Board. That Dr. Burritt was inwardly conscious of the guiding principles in obstetrics, "watchful expectancy" and "masterful inactivity", is evidenced by the fact that he first made use of his forceps on July 13, 1838. By this time, he probably had resisted the temptation to initiate his new instruments on several occasions while attending 49 cases, many of them tedious, and some suffering from want of pains.

The conservatism exemplified in the careful use of his obstetrical forceps was apparently a characteristic of the man, as well as an ideal in his early education. Dr. Burritt first attended school at Brockville. He was the son of Daniel Burritt, a United Empire Loyalist who raised and commanded a company of volunteers at Prescott, and was later at the taking of Ogdensburg in the war of 1812. It was the custom in Upper Canada before the founding of medical schools for established medical practitioners to train the young doctors. Dr. Burritt first studied medicine with Basil P. Church, of Merrickville. Later he attended the Fairfield Medical College in New York State. It may be safely assumed that a young man with a thirst for medical knowledge in the early nineteenth century would make a thorough digest of the text-books which were available at the time. As the patriotism of the Burritt family towards British Institutions had cooled sufficiently to allow their son to attend a medical college in New York State, it may be further assumed that he studied from American texts. A compendious system of midwifery, chiefly designed to facilitate the inquiries of those who may be pursuing a branch of this study, edited by Dr. Dewees, was enjoying its sixth edition in 1833. Dr. Dewees was at the time adjunct professor of midwifery in the University of Pennsylvania. This text, along with "The Principles of Midwifery", by John Burns, Glasgow, then appearing in the seventh edition, revised and enlarged, may be taken as texts that were possibly used by young Burritt previous to and perhaps after the year 1835. The medical student of today would probably feel that Dr. Burritt was extremely fortunate in having a limited choice of texts wherein the interpretations, discussions and descriptions of the necessary procedures were comprehensively described entirely by one man.

At the commencement of practice in 1835 Dr. Burritt was apparently guided by a sound and conservative obstetrical judgment. He was handicapped by the lack of a useful form of anæsthesia, of a few simple scientific aids to his art that have been developed since, and of the means of travel over the distances which he had to cover to reach his cases. In the vicinity of Ottawa, we are told that as late as 1844 such a thing as a wheeled carriage had not been seen. The roads were execrable, locomotion was on horseback, foot, or canoe, the latter being the most delightful if the weather was good and not too early in the spring or too late in the fall. Such were the conditions of travel which resisted or delighted Dr. Burritt in his work. This analysis will reveal, in retrospect, to what extent, if at all, his success with his cases was handicapped by the lack of the newer scientific knowledge and equipment, which has been developed in our profession during the last one hundred years.

Dr. Burritt's record of the 1,828 obstetrical cases delivered during fifty-one years from September 19, 1835, to June 9, 1886, is now in the museum of the Academy of Medicine, Toronto. During those years, the last thirteen of which were spent in Peterborough, there are few instances where the period of time between the delivery of the 1,854 babies would allow for an extended holiday. The number of cases attended in any one year was not high in comparison with large obstetrical practices in urban centres today, yet in view of the fact that in those days the doctor usually remained in attendance from the time he was first called until all danger of post-partum complications were over, it is safe to say that he probably spent from two to three months out of each year in the homes of others, by reason of his obstetrical practice alone.

*"Dr. Walter H. Burritt, born September 18, 1809. He was besides an active practitioner in Smith's Falls, a public man of influence, and was honoured by various public offices, as village counciller, school trustee, being chairman for 16 years, and also coroner.

"In 1870 he moved to Peterborough. He married in September, 1837, Maria, daughter of James Schofield, County Leeds." (Extract from The Medical Profession of Upper Canada, Canniff).

Total number of cases	1,828	
Maternal deaths	3	1.64 per 1,000 cases
Total number of babies	1,854	
Fetal mortality (not including 17 dissected babies)	93	48 per 1,000 cases
Premature	62	
Boys	958	
Girls	896	
Illegitimate	28	
Twins	32	
Triplets	1	

A maternal death rate of 3 in over 1,800 cases ranks well with the lowest estimate of maternal death rates in the world today. It is much lower than the estimates in urban centres in our own country, and better than the recent estimate of 2.5 per 1,000 in Denmark, where a standard in maternal care is maintained for the rest of the civilized world to follow. This is a tribute to the skill of Dr. Burritt's treatment of ante- and post-partum hæmorrhage, to his prophylactic measures against infection, and also a tribute to the high state of general health maintained in his patients by their pioneer existence. On April 27, 1846, he records the first maternal death as being due to an unavoidable hæmorrhage during a difficult breech delivery. The second fatal termination for the mother is recorded on July 9, 1853, as being due to puerperal fever. This was a case of placenta prævia which was delivered by passing the hand between the placenta and the uterus anteriorly, rupturing the membranes, and bringing down both feet. Delivery was accomplished on June 30th, the child and mother are reported as living and in good condition at the termination of the confinement. The mother died nine days later from puerperal fever. Gordon, of Aberdeen (1752-99), is now credited with having been the first to demonstrate that puerperal fever was a contagious disease. In the account of puerperal fever in Burn's text, dated 1828, the symptoms are described in a classical manner and he states: "In hospitals it has conspicuously appeared as a contagious disease. It being easy in some instances to trace the contagion from one woman to another". The agent is discussed as being related to erysipelas and as being transmitted through the atmosphere. "In private practice it is less malignant, though still very dangerous." This author warns against its frequent occurrence in protracted and difficult cases, and states that he is sorry that he finds it much easier to say "what remedies have failed than what have done good". Despite the newer forms of treatment discovered since Dr. Burritt's time, which include antiserums and sulphanilamide, prophylaxis against contagion and attention to details which will promote a fine state of general health in the patient are still the most effective methods of combating this disease.

The third and only other fatality for the mother which is reported was on December 23, 1861. This patient was delivered between convulsive seizures by dilating the os and turning the child, which was stillborn. The mother was insensible and died soon after delivery.

PRESENTATIONS

			Percentage of total babies delivered
Occiput anterior	1,677	—	90.5
Face to pubes	53	—	2.8
Breech	46	—	2.5
Feet	13	—	0.7
Face	10	—	0.5
Abnormal and complicated	55	—	3.0

Some 1,677 babies out of a total of 1,854 were born in what Dr. Burritt describes as the natural position, being occipito-anterior. Included in this group were all the occipito-anterior positions and undoubtedly many non-persisting occipito-posterior positions. There is no record of recourse to episiotomy as a means of assisting labour in any instance. Although the possible advantages of incision of the perineum were suggested by Ould in a treatise on midwifery dated 1742, it is probable that this procedure was not designated by the term episiotomy until much later. It must also be remembered that practitioners up to the late nineteenth century gained their reputations as much by their strict attention to delicacy as by their professional skill. The operator dare not subject his patient to unnecessary pain, even if by his act he was to relieve her of much agony subsequently, nor was he allowed the aid of sight, because it was highly offensive to the patient if she were exposed. Therefore he had to perform his duties under cover, and this not only included the initial examination but also the actual delivery, the drawing off of the urine, and even the application of forceps. The greatest care had to be taken before traction was begun in forceps deliveries that no portion of the mother was included in the locking blades. Dr. Dewees cites a case where a poor woman had a considerable portion of the right labium removed, by its having been included in the joint of the forceps.

FACE TO PUBES

Total	53
Forceps	9
Fetal deaths	3
Fetus dissected	3
Mothers having two presentations	3

Despite the fact that manual rotation of persistent occipito-posterior positions to the anterior positions was described in the textbooks previous to 1835, when Dr. Burritt began to practise, there is no record of his adopting this method of delivery. Fifty-three patients were delivered face to pubes in the whole series of 1,854 births. The forces of labour were assisted by the application of forceps in only 9 cases in

this group. It would be most interesting to know the length of time required for these unassisted patients to deliver themselves. The babies were dissected in three instances, where the reasons given were, impaction, presentation of the funis and death of the child, and disproportion. There were 2 fetal deaths where forceps were used and 1 in the remaining 47 unassisted cases. We are given no account of the extent of the damage to the perineum or of the efforts made to repair such damage. Primary repair of the torn perineum was described by Mariceau during the seventeenth century. Previous to the introduction of anæsthesia and a convenient material for suturing it was the custom, however, to strap the limbs together so that the torn parts would remain in apposition. Mariceau described complete perineal tears which left the vagina and rectum all in one. He advised cleansing with red wine and stitching with three or four stitches, and warned against the mother exerting strong expulsive efforts at subsequent labours in order that recurrence of the injury might be prevented.

If the progress of labour is favourable in occipito-posterior positions there are few reasons, even today, for the introduction of complicated manœuvres to keep the child from being born face to pubes. Indeed modern obstetricians are frequently embarrassed by the realization that the child is born face to pubes, in which position it is delivered with ease, after much time and skilful effort has been spent in an attempt to turn the occiput into an anterior position. On July 15, 1853, there was born face to pubes one who was later to become a very high dignitary in the Anglican Church of Canada. It was perhaps significant that this illustrious gentleman entered the world gazing toward the heavens.

BREECH PRESENTATIONS

Total babies	46	Babies born living	36
Twins	6 (cases)	" " dead	8
Girls	25	Previously dead	2
Boys	21		
Mothers having two breech deliveries			2
" " three " "			1

Concerning the conduct of breech presentations, Burns states: "Now the management of this labour is very simple. Whilst the breech is coming forth, the perineum is to be supported, and nothing more is to be done till the knees are as low as to be on a line with the fourchette." In modern phraseology we would perhaps convey the same meaning by telling students not to interfere or attempt delivery of an uncomplicated breech case until the parturient canal was dilated sufficiently to allow the child to pass through easily. The first maternal death recorded in Dr. Burritt's practice was a case in this group. "April 27, 1846, Mrs. F. P., daughter, one, breech unavoidable hæmorrhage, feet brought down; woman sank and died two hours after delivery (attended with Dr. Aitcheson)." Reasons for the death of the child were not given in all cases. Contributing factors in some cases were antepartum hæmorrhage, a small pelvis, hour-glass contraction and dry labour. It is interesting to note that two mothers gave birth to two living babies each, and one mother to three living children, all breech presentations. Mrs. J. McC. and Mrs. M. L., two cases of contracted pelvis, had stillborn babies born with the breech presenting. Dissections were performed on both these patients at subsequent confinements.

FACE PRESENTATIONS

		Fetal deaths
Total	10	4
Forceps and version	3	3
Unassisted	6	1 premature
Version	1	

One mother had two face presentations.

From the description of the methods used to facilitate delivery in the ancient texts it can be taken for granted that obstetricians of the past did not relish the experience of delivering babies in this position any more than we do today. Dr. Burritt was fortunate in that most of the unassisted cases were in multiparous patients. His own account of the four difficult deliveries is as follows:—

"June 19, 1867, Mrs. R. G., son, face, applied forceps, failure as they slipped—turned, very severe, fœtus lost, promontory of the sacrum too prominent."

"August 31, 1875, Mrs. J. M., son, face to brim of pelvis; turned; infant resuscitated; no pulsation of funis when first able to examine it—attended with Dr. H. C. Burritt."

"January 30, 1881, Mrs. W. B., son; face; did not enter pelvis; turned head with face to sacrum; still did not enter; applied forceps thrice; could not deliver; turned and made footling case; delivered with greatest difficulty; obliged to use great force to deliver head, child dead, placenta separated before turning."

"December 20, 1884, Mrs. W. S., daughter; face; very tedious, attempted forceps, failure, turned, funis twined around neck and between legs, dead. Had Dr. Burnham in consultation —gave chloroform."

ASSISTED LABOUR

Forceps	104
Ergot	67
Versions	28
Dissections	17
Chloroform	2

Forceps delivery.—In a total of 1,854 births attended personally by Dr. Burritt instrumental delivery was performed on 104 occasions, an incidence of 5.6 per cent. We have no means of knowing when instruments were first used in the art of obstetrics. Soranus of Ephesus de-

scribed the method of applying extraction hooks in the second century A.D. In the year 1672 Chamberlen first intimated that his father, himself, and his brother possessed a secret by which they could successfully deliver women without destroying the child, though the pelvis be very small. The secret was apparently not made public until 1753. The instrument so revealed was known under the name of the lever, but it was later ascertained that the Chamberlens also employed forceps. In the textbooks previous to 1835 the indications and contraindications for the use of forceps were comprehensively discussed. Due account was taken of the possible increase in the discomfort to the patient during the necessary manipulation in the proper fitting of the instruments and the subsequent unnatural delivery. For the 104 cases delivered by forceps the indications recorded by Dr. Burritt in his practice were as follows:—

Want of pains	46
Disparity—large head	27
Face to pubes	9
Cessation of pains	7
Twins	4
Small pelvis	4
Funis about neck	2
Hydrops cerebri	2
Funis presenting	1
Hour-glass contraction	2
Convulsions	1

There were 9 fetal deaths among the 104 babies delivered by this means. From the time Dr. Burritt began to use his forceps in 1838, three years after he had placed his order with the local smithy, until later in his career, when he was frequently called as a consulting obstetrician, his average which began at one instrumental in every sixty deliveries had risen to approximately one in ten. His reasoning on the indications for the use of forceps was quite in keeping if not in advance of the discussions in the literature of the time. Dr. Smellie in 1742 calculated that forceps were required once in 125 cases of labour, after which there was apparently a deterioration in the practice with the indications falling off to once in 158 to 188 cases. One gentleman, not named but quoted in 1833, claimed that in hospital practice forceps were not necessary above once in 728 cases and in private practice above once in 1,000. Dr. Nägele and Dr. Burns, in 1828, gave their individual indications as once in 53 cases, which corresponds closely to the practice followed by Dr. Burritt in his early days. At the present time there are very few contraindications to the judicious use of low forceps, combined with episiotomy, if necessary, in order to shorten the duration of a prolonged second stage of labour.

On the secale cornutum, or ergot.—John Stearns, a prominent New York obstetrician early in the nineteenth century, is credited with bringing ergot before the public in a form to arrest the attention of medical men. He was the recipient of great honour in the profession as a result of the description of its use by private letter in 1807 and later in an article in Volume 5 of the *Medical Record*, 1822. In divulging the secret of his method one wonders if this great and learned man felt slightly humiliated when he admitted that he was informed of the powerful effects of this substance some years previously by an ignorant Scotch woman, who may have been illiterate but who was not so ignorant in some ways. It is more than probable that the power of ergot over the uterine muscle was known in Germany before it attracted notice in France or the English-speaking countries. The German name for ergot, according to Goupil, was "*Mutter Korn*" or womb grain, *Mutter* signifying womb.

Dr. Dewees discusses the use of ergot during labour and laid down the rules for its use in his text dated 1833. He cautioned against its use too early in labour, in obstructed labour and during certain types of ante-partum hæmorrhage. He speaks strongly against intemperate use, and accuses it of sacrificing four-fold if not a twenty-fold greater number of victims in the few years since its introduction than had perished from the unwarrantable use of the crotchet for a century past.

Dr. Burritt first administered ergot for want of pains on March 21, 1835. During the remainder of his practice he administered this drug in only 67 of his 1,828 cases, a use which could scarcely be labelled as indiscriminate. The indications for the use of ergot were "deficiency of pains" and "tedious labour". It is recorded as being used on only one occasion for control of hæmorrhage post-partum. The first recorded hypodermic administration was on August 15, 1880. From May 7, 1860, to September 30, 1867, the use of forceps replaced ergot as a measure in cases of want of pains. No ergot was recorded as being prescribed during that seven years. Hour-glass contraction was recorded in 4 of the 67 cases where ergot was used. There were 7 fetal deaths in this group, 4 of them in cases of hour-glass contraction of the uterus.

Hour-glass contraction (total)	11	
Extraction of placenta	11	
Fetal deaths	6	
Ergot used	4	(fetal deaths in all cases)
Presentations:		
Occiput anterior	6	
Footling	2	
Breech	1	
Twins	2	cases (fetal deaths in one case)

Hour-glass contraction in Dr. Burritt's practice apparently occurred in dry tedious hard labours. In every case in this group where ergot was administered the babies were stillborn. It is however, more than possible that the difficult labour was the chief contributing factor in the fetal death. During recent years the practice of giving ergot before delivery of the child is considered dangerous to the interests of the child,

and if given during the third stage before the placenta is delivered the latter is frequently retained in the tonically contracted uterus. There is no doubt that the doses that we are accustomed to administer in more recent times are much more potent than those given by Dr. Burritt. Extraction of the placenta was found to be necessary in all cases of hour-glass contraction of the uterus.

Podalic version.—This operation had been practised by the ancients in the time of Celsus, Soranus, and Philumenos, and was perhaps continuously in vogue down through the centuries. Literature on the subject previous to the writings of Ambroise Paré (1510-1590), however, shows that no general rules of conduct existed; on the contrary, practitioners were almost invariably in the habit of trying to remove the abnormal presenting part and to bring the head to the os uteri. Paré was among the first who advised turning as a general practice, but apparently his pupil Guillimeau disregarded the rule and left it to Marceau to enforce it, both by reasoning and practice. Regarding the difficulty of performing the operation without anæsthesia Burns warns against attempting version unless the uterus is quiescent, on account of the great agony produced. Copious blood-letting was said to have the power of rendering turning easy. Apparently the natural anæsthesia produced by a state of complete exhaustion served a useful purpose in ancient times, and it is obvious from the record that this same state must have rendered the manipulative efforts of Dr. Burritt less distasteful to the patient in many instances. Burns recommended a powerful dose of tincture of opium as a preliminary treatment.

			Fetal deaths
Version (total)	28		20
Arm presenting	7	(one cord also)	6
Face presenting	4		3
Shoulder presenting	2		1
Hand presenting	2	(one induced)	2
Placenta prævia	3		1
Cord presenting	3	(one shoulder)	3
Small pelvis	5		5
Face to pubes	1		1
Hip	1		

Dr. Burritt resorted to this method of delivery in 28 cases of abnormal presentation. There is no doubt that labour was frequently well advanced by the time he was called, and therefore recourse to external version was excluded. Five cases of vertex presentation, including four face presentations and one head and funis presentation, were turned. The other 23 cases were for such complications as placenta prævia and arm, shoulder and hand presentations, as shown in the summary. Mrs. A. J. had previously had a dissection because of a small pelvis. Labour was induced at seven months in her case, a hand was the presenting part and the child was unfortunately stillborn. The fetal mortality in this group was high, twenty babies succumbing during delivery. In two cases the child was dead before delivery was attempted and in six the child lived. Of the latter the indications for version were: placenta prævia 2, face 1, shoulder 1, arm 1, and one distortion of the pelvis where the child lived for fifteen minutes only.

DISSECTION

Deformity of pelvis	13
Face to pubes:	
Impacted	1
Presentation of funis; death of child	1
Plus disproportion	1
Hydrops cerebri	1
Total	17

In the chapter on fetal mortality it will be obvious that there were few instances where Dr. Burritt was given an opportunity to exercise his skill in the interests of the child. He was called too late, or the odds were against him when he arrived. We have now to deal with a group of cases of fetal mortality not included in the former, because between the years 1835 to 1886 the only method of delivery which could have saved the infant was not in vogue in Upper Canada, nor was it considered with feelings other than timidity and horror in other parts of the world, *i.e.*, Cæsarean section. Had this operation been in vogue and successfully employed at this time it is of interest to note from Dr. Burritt's records that his indications for the operation would most likely have been limited to cases of deformed pelvis where the child was living—giving him a percentage of less than 0.85 for delivery by Cæsarean section. Commenting on the indications for Cæsarean operation in his text (1828), John Burns states (p. 442) "As the Cæsarean operation is full of danger to the mother no British practitioner will perform it when delivery can, by destruction of the child, be procured per vias naturales"; and, later, "There are, I think, histories of 23 cases where this operation has been performed in Britain: out of these only one woman has been saved, but eleven children have been preserved". French critics at the time report about a 50 per cent mortality for the mother, and state that the reason for the high mortality in Great Britain was because the operation was invariably delayed too long. Dr. Dewees in describing the operation in his text in 1833 states: "Having never performed this operation on the living subject, nor ever having seen it performed, I must rely upon the practice and experience of others for the manner in which it should be done." He then describes the method proposed by Baudelocque which is similar to the technique of the high section of today. Space will not allow us to follow the history of this operation through the years which represent the active career of Dr. Burritt. As his records show a 100 per cent good result with the mothers in this group one

can only respect his judgment in avoiding this method of delivery under the circumstances. That he could successfully deliver 16 cases by embryotomy, without anæsthesia, without antiseptics, without adequate skilled assistance, and without a maternal death, is to many of us incredible. There is, however, conclusive evidence for the survival of the mothers in some instances, because other confinements were reported at a later date and one mother had two of the dissections for successive deliveries. Mrs. A. J. delivered by dissection because of deformity of pelvis on January 14, 1837, had an induction of labour at seven months on June 11, 1842, which was conducted by version because of a hand presenting. This child was unfortunately stillborn. Mrs. M. L. had a breech delivery on April 18, 1862; fetus gasped and died. On June 27, 1863, she was delivered of a stillborn child by version because of narrowness of the brim. On March 15, 1865, she had an embryotomy with delivery and a second embryotomy on December 11, 1867. Mrs. J. McC. was delivered on February 16, 1848, by "instrumental dissection from straight pelvis, the severest case I ever saw", and again on June 16, 1855, she had a stillbirth by breech delivery, "dead from too small a pelvis". Mrs. T. C. was delivered by craniotomy on December 23, 1860, for disproportion—she had been delivered of a decomposed fetus two years previously, and the records show that she had at least three tedious but otherwise normal confinements after 1860. While the names of the mothers in the other twelve dissected cases do not again appear in the lists, Dr. Burritt reports no fatalities in his records of this group, and from the care which is represented in his notes one has every reason to believe that there were no omissions of such important facts.

Anæsthesia in obstetrics.—The inscription under the bust of Sir J. Y. Simpson in St. Andrew's Chapel, Westminster Abbey, reads as follows:—"To whose genius and benevolence the world owes the blessings derived from the use of chloroform for the relief of suffering. Laus Deo." As the account of the discovery of anæsthesia must be brief I will quote Dr. Simpson from a letter written in a spirited defence of his discovery, in April, 1870, a few days prior to his death on May 6, 1870.

"From ancient times anæsthesia in surgery has been attempted by various agents or anæsthetics, but till latterly with very uncertain or equivocal effects. At the present time three kinds of anæsthetics are principally and specially used in practice, *viz.*:—

1. Nitrous oxide gas, now, I believe, employed extensively in dental surgery, etc., since it was re-introduced a few years ago by Dr. Evans, of Paris; but originally suggested by Sir Humphrey Davey in 1800, and practically and successfully employed by Dr. Horace Wells in Hartford in 1844.

2. Sulphuric ether, first used by Dr. Morton, at Boston in 1846.

3. Chloroform, first employed in Edinburgh in 1847."

At the time of its introduction chloroform was denounced by prejudiced individuals as being dangerous to health, morals and religion. Speaking in its favour in answer to queries, Dr. Meigs in a communication dated Philadelphia, February 18, 1848, replies to Dr. Simpson, and quotes in round American numbers: "I readily hear, before your voice can reach my ears from beyond the Atlantic, the triumphant reply that an hundred thousand have taken it without accident."

Had Dr. Burritt received the news by radio in 1847 we would still be in doubt as to when the first shipment of chloroform could have reached Smith's Falls or Peterborough. In the first record of its use, March 27, 1877, we find him questioning its action as being a possible factor in causing the death of the child. The only other occasion on which it is mentioned is in connection with a difficult delivery of a face presentation. On this occasion, December 20, 1884, Dr. Burnham, of Peterborough, produced what must have been a very satisfactory state of anæsthesia by that means.

FACTORS CONTRIBUTING TO FETAL MORTALITY

FETAL DEATHS TOTAL, 93; DISSECTED CASES, 17

Abnormal presentations delivered by version	20
Prolapse of cord	18
Dissection, for small pelvis and impacted cases	17
Ante-partum hæmorrhage and placenta prævia	10
Twins, including abnormal presentations and prematures	9
Forceps delivery alone	9
Prematurity alone	9
Breech deliveries	8
Ergot, where used in tedious cases	7
Face to pubes cases	6
Hour-glass contraction—tedious cases	5
Eclampsia	4
Feet presentations	4
Face presentations	3

(Single fetal deaths frequently represent two or more contributing factors.).

The complications listed as contributing factors in fetal mortality in cases where the fetus was over seven and one-half months are similar to those encountered in any large obstetrical service today. In many cases Dr. Burritt had to deal with more than one serious complication. With few exceptions, where delivery by version was the elected method, the presentation was arm, face, or shoulder, sometimes complicated by a narrow pelvis and very frequently by prolapse of the funis. No mention is made of the administration of pre-operative sedatives or anæsthesia in any of these difficult deliveries. It is of interest to note that out of 67 cases where ergot was used during labour there were only 7 fetal deaths; in 53 cases of persistent posterior delivered face to pubes there were 6 fetal deaths; and in 46 breech deliveries there were 8 fetal deaths. The records show that the fetal deaths occurred singly in families, with the exception of five instances, three of which will be discussed here, and comments on the other two cases will be found under the chapter on Dissection. One woman, Mrs. H. C., lost two consecutive babies from prolapse of the funis. Dr. Burritt comments: "Natural, excepting prolapse of funis,

child dead before I reached the house". Three years later the same patient lost her second child, noted under the comment: "Arm, version—very difficult, dead". Mrs. R. G., the second patient to lose two babies, had her first confinement on August 12, 1851. It was described as "Natural, died from severe compression of the funis, from waters being too long drained off and descent of funis, turned, as head would not enter pelvis and child being dead". On February 3, 1853, this patient lost her second child, "Natural, premature, hæmorrhage and fainting before pains began, ergot used, hair lip, child dead from loss of blood". Mrs. R. S. was bereaved also on two occasions. On January 13, 1867, Dr. Burritt was called on account of a severe hæmorrhage with no pains. The child was dead four hours after hæmorrhage and rupture of the membranes. Placenta prævia with head and funis presenting was the diagnosis, and delivery was accomplished by version. Mrs. S. again found herself in difficulties on October 4, 1868, this time with funis and shoulder presenting, with rupture of the membranes fifty-two hours before delivery. Dr. Burritt again delivered a stillborn child by version. While there is no record of further confinements in these cases, I am happy to say that the records do show that Dr. Burritt brought one or more bonny babies to a large percentage of the patients who had been unfortunate on a single occasion.

COMPLICATIONS

Ante-partum hæmorrhage	16
Post-partum hæmorrhage	15
Toxæmias	10
Hour-glass contraction	11
Adherent placentæ	9
Placenta prævia included in ante-partum hæmorrhage	6

Ante-partum hæmorrhage and placenta prævia.—The best recommendation for any form of treatment is the results obtained by the methods which have been used. We are not familiar with the actual details in the treatment of ante-partum hæmorrhage in the 16 cases attended by Dr. Burritt. His results, however, appear even to the most severe critics as being excellent. Ante-partum hæmorrhage and placenta prævia as single or combined complications undoubtedly contributed to the death of Mrs. C., who died on July 9, 1853, from puerperal sepsis nine days after delivery by version because of ante-partum hæmorrhage and placenta prævia. The child in this case lived. These conditions were directly responsible for 10 fetal deaths. Five children are reported as safe, and the condition of the remaining one, a seven-month premature, was not reported. In those days safety in the care of these patients was not to be found in either rashness or procrastination. We are able to ascertain that Dr. Burritt resorted to the vaginal plug and rest, with tincture of opium, in cases where the cervix was rigid and undilated. Syncope was not combated too vigorously. In the teaching of the day, faintness was considered to favour dilatation of the cervix and cessation of the hæmorrhage. When the cervix was dilated the membranes were ruptured, ergot was administered, and delivery by version instituted. Six of the 16 cases were definite cases of placenta prævia. It is quite possible that some of the others were cases of marginal placenta prævia, and in one where the placenta was separated before delivery it is possible that it was a case of central location. In a number of cases the mother had subsequent confinements without suffering from the effects of this complication, which, even today, ranks along with the eclamptic state as one of the two most alarming emergencies in the practice of obstetrics.

The toxæmias of pregnancy.—Concerning the treatment of convulsions Burns writes in 1829 "I shall only remark that the first and most essential thing to be done is to detract blood freely from the vein; next, the bowels are to be immediately opened by a clyster, and then a purgative is to be administered". If headache and œdema were present diuretics were to be administered and he stated that the disease could be prevented by mild laxatives and light diet. Albumin in the urine was recognized as a symptom of the eclamptic state by Weaver, of Guy's Hospital, about 1842.

The case notes show that 10 patients out of the total of 1,828 showed symptoms of an advanced state of toxæmia. One of these suffered from attacks of hysteria previous to delivery. Two others vomited persistently for some time before the onset of labour. The notes on these cases read: "September 12, 1851, Mrs. E. D., one daughter, natural presentation, premature, vomiting for three days, resisting all remedies, finally arrested by creosote". (In some modern texts on therapeutics creosote is said to be a valuable remedy in cases of indigestion with fermentation.) Again, "March 29, 1880, Mrs. J. R., one son, feet and breech, funis around neck, very small and weak, has had constant pain for three weeks with vomiting". Two patients had a venesection "from fear of convulsions" and "to avert threatened convulsions". He does not state his reasons for suspecting the onset of convulsive seizures, but from the accounts in the literature œdema and headache were perhaps the conspicuous symptoms in these two patients. The other 5 patients had definite puerperal convulsive seizures, and the eclamptic state proved fatal to both mother and daughter in one instance. The reader would possibly appreciate having a brief story of these five cases in Dr. Burritt's own words. Taken in order and as they appeared to the doctor:—"December 10, 1846, Miss M. A. D., son, natural, premature, puerperal convulsions 27 in number, 8 after delivery." "June 11, 1860, Mrs. H. C., son, natural dead fetus, puerperal convulsions." "December 23, 1861, Mrs. J. T., daughter, natural, puerperal convulsions, dilated os, turned and delivered, fetus dead, mother

insensible, dies." "January 18, 1873, Mrs. J. T. (née Glover), daughter, natural puerperal convulsion ¾ hour after." "February 29, 1876, Mrs. J. R., son, natural, dead same day, preceded on 24th and 25th by puerperal convulsions, premature." There is some ambiguity concerning the last note in that "dead same day" might also refer to the mother. However, in view of the brief but emphatic precision of the notes throughout the record the author has accepted this remark as applying to the child alone.

CONGENITAL DISEASES AND DEFORMITIES

Congenital deformity (total)	20	
Hydrocephalus	6	
Spina bifida	5	(with meningocele:1)
Meningocele	3	(one acephalic)
Acephalus	2	
Club foot	2	(with spina bifida:1)
Hair lip	2	
No right hand	1	
Deformity, not stated	2	

Congenital deformities were adequately described in the literature previous to the time when Dr. Burritt began to study medicine. Numerous pregnancies at very short intervals were at one time thought to be a factor which predisposed toward congenital deformity. Time did not allow the author to follow the history of the confinements in every individual case where a deformed child was born. One mother gave birth to a second deformed child thirteen months after the first one. There was no record of other confinements in her case. Among the other 19 mothers pregnancies which resulted in the birth of normal children were frequently noted but not accurately tabulated in the preparation of this analysis.

Symptoms of congenital syphilis had also been described previous to Dr. Burritt's time. While one might suspect syphilis as having been a factor in 9 recorded instances of decomposition of the fetus, there was no conclusive evidence for such an assumption. This diagnosis could perhaps be positively made in one case, where, according to Dr. Burritt's report, the fetus was "dropsical, so much so that the scalp was torn half off the cranium; placenta, one half larger than any I ever saw, was partially separated before labour, stillborn, ergot given, very severe".

A variety of minor observations and practices are noted in Dr. Burritt's record which are of passing interest. Antimony tartrate was frequently employed in cases of rigidity of the cervix. Apparently, before the introduction of anæsthetics, emetic doses of this substance were administered to relax the muscles in reducing dislocations and fractures. Bronchocele was found to be present in both mother and child in one case. One patient had been told by a doctor that she had an abdominal tumour; later two physicians agreed that the enlargement was due to dropsy. This patient was about to set out to Toronto for a consultation when labour began and the tumour turned out to be a bouncing baby.

The names of both parents are nearly always given in the illegitimate cases. Time and space does not permit comment on many of the remarks which have a personal rather than a scientific interest. Dr. Burritt's record is perhaps the only birth register in existence for many members of eastern Ontario families of that time.

From the standpoint of modern obstetricians this analysis is unusually interesting. It is obvious that Dr. Burritt could have reduced the fetal mortality considerably had he had the opportunity of offering pre-natal care and advice to many of his patients. Under the circumstances this was impossible. Pre-natal care and the use of a satisfactory means of anæsthesia are the two outstanding advances in obstetrical art since his time. It is true that we have since discovered the actual strain of streptococci which is the organism responsible for epidemic puerperal infections. Dr. Burritt was perhaps aware of the contagious nature of this disease, but the fact that the population was not concentrated in his district was a natural preventive. He was perhaps not aware of the fact that he himself might transmit the infection from his own nose and throat. However, the custom of keeping the patient covered with the bed linen from her own bed was undoubtedly a better method of preventing infection by air-borne bacteria from the attendants than resorting to face masks for the operators with the patient exposed. So far as we are aware antiseptic solutions were not used in his practice. Heart disease did not claim a single victim. The mothers were again fortunate in this regard in that during their early years they were not exposed to the concentrated contagions which are responsible for the diseases of the heart which tend to raise the maternal mortality in large urban centres today.

To Prof. J. H. Elliott and the other members of the Historical and Library Committees of the Academy of Medicine, the author is under more than ordinary obligation for the privilege of making this analysis.

Cancer cells can be kept for more than a year at the very low temperature of 70 degrees Centigrade (94° below zero Fahrenheit), and when thawed out and implanted in mice still prove themselves fully virulent and able to cause the disease. This discovery, of much interest to workers on the cancer problem, is reported in *Science* by Drs. C. Breedis and J. Furth, of Cornell University. Doctors Breedis and Furth experimented with many different kinds of cancer cells, taking an hour to reduce them to this low temperature, at which they were then kept for periods of from one to four hundred and forty days. The thawing out was done rapidly, for it was found that slow thawing was more likely to injure the tissue.

Association Notes

ALL ROADS LEAD TO MONTREAL

To a degree which is increasing each year Montreal is becoming one of the outstanding cities of the North American continent chosen for the holding of conventions. Several factors are responsible for its popularity with the tourists and with those whose task it is to arrange annual meetings.

The first quality favouring Montreal as a convention city is its accessibility. There is scarcely a large centre in the whole of Canada or in the northeastern part of the United States from which the traveller cannot take a fast express train and proceed without change to Canada's largest city. Convenient air-service for passengers links Montreal with Boston and with Newark, whence connection can be made with air-lines radiating to all parts of the continent. Should the tourist prefer to travel by water, luxurious steamships, plying inland waterways, will bring him to Lachine Wharf, while no less comfortable coastal vessels provide a frequent service from the Maritimes and Newfoundland to the main harbour. Finally, should the visitor prefer to come in his own car he will find the way easy and agreeable. The Province of Quebec has spent large sums during the past five years for the purpose of bringing the highways of the province up to the excellent standard demanded by present-day motor traffic. Recent improvements to the road approaches to Montreal include the Quebec highway, with its new bridges at the eastern end of the city which will be finished early in 1939, the Jacques Cartier Bridge, with its system of concrete highway approaches from the south and east, the Ottawa highway, and, finally, the new road to the Laurentians, opened in 1938. Those who bring their cars to Montreal in June can rest assured that they will not have, in the hotel and convention area of the city, the annoyance of congested traffic so common in the central districts of larger cities.

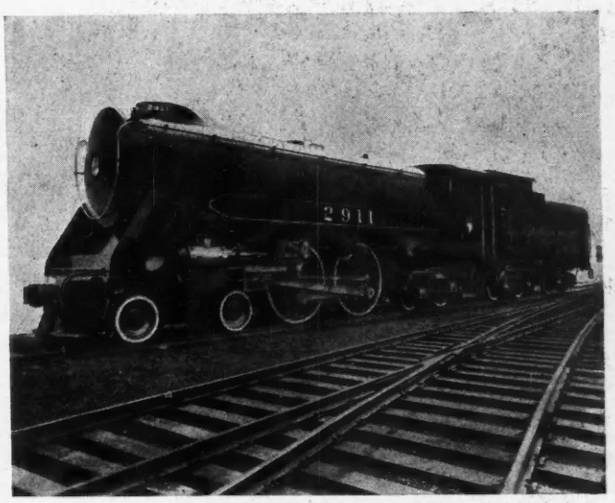

Fig. 1.—Up-to-date Engine.

Nearly every big city has some one or two distinctive characteristics which make it different from other cities. Montreal has so many that it is a source of never-ending delight to the citizens of other centres on this continent. Founded in 1642, it ranks with Quebec and Boston in antiquity. Populated almost wholly by the French until 1760, it retains, along with its predominance of French citizens, all of the charm and picturesque quality which has marked French-Canadian architecture and life for more than three hundred years. To those who take pleasure in the arts of bygone days the museums and shops of Montreal will offer much of interest and instruction.

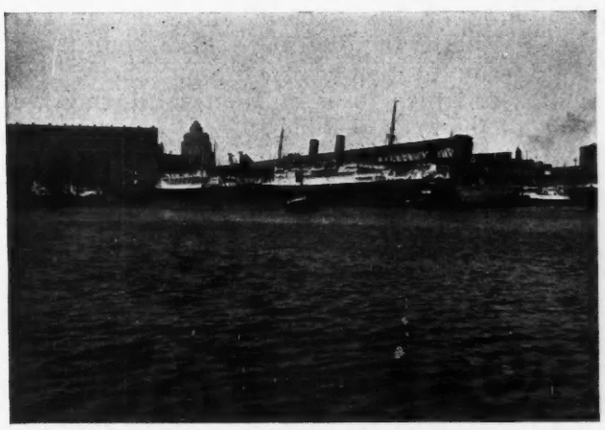

Fig. 2.—Scene in Montreal Harbour.

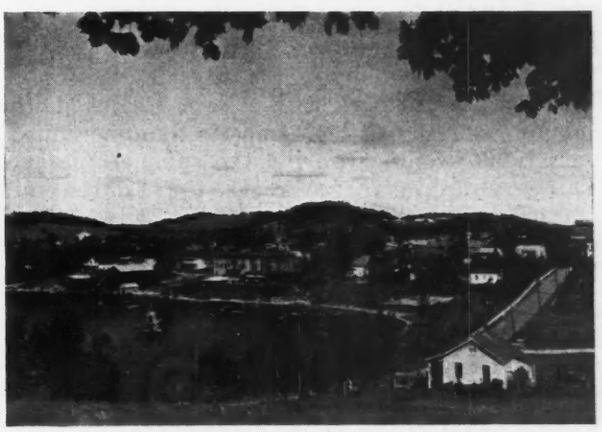

Fig. 3.—In the Laurentian Mountains.

Alongside all that is picturesque and historical we have a fine modern city and a deep-sea port

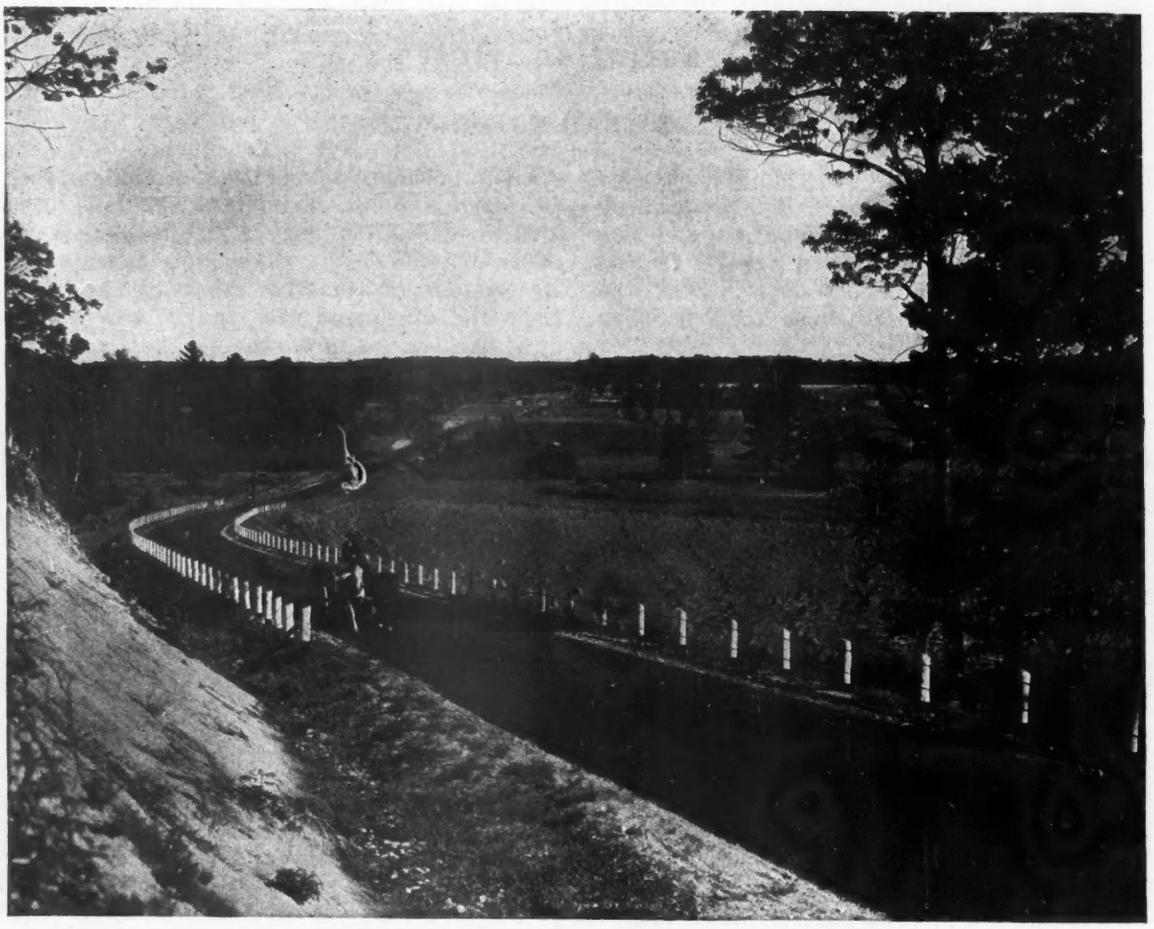

Fig. 4.—Ottawa-Montreal Motor Road.

second only to New York in the Western World —a port to which vessels come from every part of the globe.

Finally, Montreal is well equipped to offer every sort of recreation and diversion to the tourist. In the midst of the city stands Mount Royal, a natural park with a large Chalet at its summit—the site of Les Concerts Symphoniques on Friday evenings during the summer season. Thirty miles north we reach the Laurentian playground of mountains and lakes, while a few miles west, where the St. Lawrence broadens into Lake St. Louis, there is excellent yatching.

Great preparations are being made by the local entertainment committee to assure everyone who comes to the 1939 convention a happy vacation. Plans include a garden party, golf and motoring about the neighbouring country, as well as private entertainment. Later issues of the *Journal* will carry details of musical or dramatic offerings which may be available for those who are interested in taking advantage of these features of city life.

The local committees will be glad to do anything possible to help those who are interested in holding small or large reunions during the week of the convention. Needless to say, every assistance will be given to those who wish to spend a part of the week about the local hospitals or laboratories.

It will be possible, we hope, to announce the high-lights of the scientific program in the March issue of the *Journal*. Make your plans now; write to the hotel of your choice this month; and plan to be in Montreal during the whole of the week of June 19.

The Canadian Medical Association—Nova Scotia Division

(The Medical Society of Nova Scotia)

A meeting of the Executive Committee of the Medical Society of Nova Scotia was held on November 15, 1938. Dr. J. H. L. Simpson, of Springhill, presided.

The following were recommended for Senior Membership in the Canadian Medical Association.

Drs. A. S. Kendall, of Sydney; J. J. Cameron, of Antigonish; H. V. Kent, of Truro; M. A. Curry, of Halifax; J. W. Smith, of Liverpool; C. A. S. McQueen, of Amherst; L. M. Silver, of Halifax; C. A. Webster, of Yarmouth.

Dr. J. R. Corston was elected as the representative of the Nova Scotia Division on the Executive of the Canadian Medical Association.

Dr. J. H. L. Simpson was chosen as representative on the Nominating Committee of the Canadian Medical Association.

The following were nominated and duly elected to the Council of the Canadian Medical Association:—Drs. W. N. Rehfuss, of Bridgewater; H. K. MacDonald, of Halifax; J. G. B. Lynch, of Sydney; M. G. Tompkins, of Dominion; L. R. Morse, of Lawrencetown; E. F. Ross, of Halifax; A. B. Campbell, of Bear River.

A letter from Dr. T. C. Routley, General Secretary of the Canadian Medical Association, in regard to the question of increasing membership in the Canadian Medical Association, was read. A specific suggestion was made in it that additional *Journals* (for December) be sent out by the provinces, following the lead of the Ontario Medical Association, and the Division of Saskatchewan, to be issued at cost. Drs. Corston and Grant reported that they had taken on themselves to put into effect this suggestion in connection with the Nova Scotia Society, and their action was endorsed by the Executive. One hundred and one names were sent in to the General Secretary.

Hospital Service Department Notes

Tariff Lowered on United States Medical Equipment

Effective from January 1st of this year the new trade agreement between the United States and Canada has lowered the customs tariff rate on a number of hospital and medical articles of equipment when imported from the United States.

X-ray apparatus, surgical needles, dental instruments, microscopes and complete parts thereof have been dutiable 10 per cent (free under British Preference) under Item 476 (ii). They are now restored again to the free list (restored Item 476).

Sulphuric ether and chloroform are taxed but 20 per cent instead of 25 per cent under Item 219d. These have had free entry from Great Britain for several years.

Surgical dressings, trusses, abdominal supports, etc., have been reduced from 25 per cent to 20 per cent under Item 236. The British Preferential Tariff Rate is 10 per cent; General Rate, 35 per cent.

Dextrose (glucose) solutions for parenteral administration are now free under Item 220. Under this item dry medicinal, chemical and pharmaceutical preparations, compounded of more than one substance, have been reduced from 25 - 10 per cent to 20 per cent. If liquid and not containing over 2½ per cent of proof spirit, from 40 - 20 per cent to 27½ per cent.

Chemicals and drugs of a kind not produced in Canada (Item 208T), formerly free under the British Preferential Treaty and dutiable 25 per cent under other headings, have been separately handled, the new rates ranging from 12½ per cent, 17½ per cent, and some remaining at 25 per cent.

A number of other items relating to hospital or medical supplies or equipment have been free under all classifications and are not affected by the new trade agreement.

All communications intended for the Department of Hospital Service of the Canadian Medical Association should be addressed to Dr. Harvey Agnew, 184 College Street, Toronto.

The Cancer Campaign

The Canadian Society for Control of Cancer

Dr. G. Stewart Cameron, of Peterborough, recently gave a very instructive talk before the Women's University Club of Peterborough. Drs. J. S. McEachern and W. H. McGuffin, of Calgary, also spoke at an organization meeting of the Edmonton Unit. The value of public enlightenment such as is accomplished by these talks was aptly demonstrated in a recent case when a woman recognized in herself an early case of cancer, reported at once for treatment, was operated upon, and as a result has been given an excellent prognosis. It ought to be possible to report in the coming years many such cases.

Attention is directed to an excellent article on Cancer of the Breast by Gordon Gordon-Taylor, O.B.E., M.A., F.R.C.S. in the *Brit. M.J.* of Nov. 26, 1938. He reports 603 cases which he personally treated between 1908 and 1938. In Group One cases he reports a survival for 10 years or more in 84.07 per cent. Excellent statistics such as these demonstrate the necessity for making a concentrated attempt to obtain these patients at the earliest possible time. If this could be accomplished and adequate treatment instituted excellent statistics such as these would become more and more common.

It is gratifying also to note as a reason for greater optimism the report in the *Cleveland Clinic Quarterly*, Vol. 5, No. 4, October, 1938, the report of a successful case of resection of the head of the pancreas by Dr. George Crile, Jr. This makes a total of seven such successful cases. Prior to 1935 all such cases were given up as hopeless. Indeed, since 1935 doubtless many other cases have been treated only by palliative means, whereas more heroic methods might have saved at least a few. In dealing with a disease so lethal as cancer surely palliative methods have little place where there is even a chance of a successful outcome if more radical methods are adopted.

The British Empire Cancer Campaign

The fifteenth annual general meeting of the British Empire Cancer Campaign was held at the House of Lords on November 29, the Duke of Gloucester presiding.

The annual report which was approved at the meeting embodied as usual the statements by the various institutions and individuals working under the ægis of the Campaign in this country and the Dominions. A vast amount of interesting detail is given from which a few distinct lines of progress can be discerned. Further study has taken place on the tumour-producing agents of the filterable fowl sarcomata; improved methods of obtaining large quantities of purified suspensions of these particulate agents have been employed in serological work. Tumour immunity, tumour metabolism, and the mode of action of cancer-producing compounds continue to interest workers in several centres. Increased knowledge has been gained as to the types of substitution which lead to cancer-producing activity in the benzanthracene hydrocarbons. On the subject of hormones, the influence of testosterone propionate and similar preparations in cases of chronic mastitis has been investigated. The results with testosterone are encouraging, but not up to the present those with oestrin injections. Reports from many centres are forthcoming on the physical and biological effects of x-rays and radium, and to this has been added research on short wireless waves and their heat production in the tissues. Some clinical work was undertaken at Newcastle-upon-Tyne in the hope that the temperature of a patient might be kept sufficiently high for a long enough time to destroy generalized metastases, but no cure has been effected in four advanced cases which were submitted to the experiment. There are some grounds for the belief that heat produced by short wireless waves may have a selective destructive action on certain malignant tissues, but up to the moment it is not possible to arrive at conclusions. The biological effects of neutrons are also being actively studied and compared with those of x-ray and gamma-ray energy. Mr. Lockhart-Mummery in his foreword says:

"It would seem that in future the study of growth-stimulating and growth-inhibiting substances is likely to be a profitable field of research. Little is known about such substances at present, and many difficulties must be removed before advance along this path is attained. No one can say by which path the final goal will be reached, nor when the secret (of the causes of cancer) will be found. In the meantime we push on with courage and with confidence along every path which seems to lead to the discovery."—*Brit. M. J.*, 1938, **2**: 1216.

The British Government's Cancer Campaign

The Cancer Bill, in which the Government's plans for a great campaign against the disease are outlined, was formally presented to the House of Commons last week. The main object of the measure is to provide expert advice and treatment for all who suffer, or fear that they suffer, from cancer.

It is estimated that the campaign will cost £600,000 a year for England and Wales and £100,000 for Scotland, half of which will come from central funds.

Cancer is now causing 70,000 deaths a year—a figure which has risen steadily in recent years—and it is second only to heart disease as a cause of death. The average age of those who die from cancer is about 49.

After long discussion with the local authorities the Government have decided to place on county and county borough councils, either singly or in regional groups, the duty of securing adequate facilities for the diagnosis and treatment of persons suffering, or suspected to be suffering, from cancer. It is estimated that at present only one case in four which might hopefully be treated by modern methods is so treated.

It is important to secure early diagnosis of cancer if treatment is to be successful, and it is proposed to have diagnostic centres at which expert clinical advice on a team basis will be available to all. In general these centres will be in the large towns, and patients will come to them from the surrounding areas. Facilities for treatment will be provided in voluntary hospitals, whose services it is hoped to utilize to the utmost, or in hospitals under the control of local authorities. The Government intend to bring the most modern methods of treatment, whether by surgery, radium or deep x-rays—alone or in combination—within the reach of every sufferer.

The Bill enables the Minister to lend up to £500,000 to the National Radium Trust for the purchase of radium and other radio-active substances and of equipment for radio-therapeutic treatment. The Trust has already arranged an option for a substantial purchase of radium from Canada at a fixed price over the next five years.

The Duke of Gloucester, as president of the British Empire Cancer Campaign, took the chair last week at the annual meeting of the organization. He read a message from the Minister of Health stating that the Government looked to the British Empire Cancer Campaign and kindred movements not only to continue their present efforts but to be responsible for the extension of research into the causes and cure of cancer.—*Weekly Times*, London, Dec. 8, 1938.

The Third International Cancer Congress, under the auspices of the International Union Against Cancer, will take place at Atlantic City, N.J., U.S.A., from Sept. 11-16, 1939. Membership in the Congress can be secured for $15.00 (U.S.) on application to the Secretary-Treasurer, Dr. Donald S. Childs, 713 E. Genesee Street, Syracuse, N.Y.

Medical Societies

The Saint John Medical Society

A special meeting of the Saint John Medical Society was held on December 9th at which the speakers were Dr. Primrose and Dr. Ross, of Toronto. These gentlemen addressed a public meeting in the interest of the Canadian Society for the Control of Cancer. The meeting was largely attended in spite of the short notice given. The publicity provided by the local press and broadcasting station is perhaps an indication of the marked and generous interest of the public on this subject. While in Saint John, Dr. Primrose and Dr .Ross were entertained by His Honour, Dr. Murray McLaren, Lieutenant-Governor of the Province.

The regular December meeting of this Society was held on December 7th in the Admiral Beatty Hotel. The special speaker on this occasion was Dr. George Skinner, of the surgical staff of the Saint John Hospitals. Dr. Skinner spoke on some of the newer conceptions of bone repair, with special reference to the part played by accurate fixation, complete reduction of fracture, and discussed the physiology of calcium changes in injured bones as well as the part played by local hyperæmia as a cause of delayed union and traumatic atrophy.

The January meeting was held on January 4th, and Dr. L. McPherson, of the staff of the Saint John Tuberculosis Hospital was the invited speaker. His subject was "Extrapulmonary tuberculosis". He discussed chiefly "Tuberculosis of the skeletal system", and showed many interesting lantern slide, records of tuberculosis of the hip, knee, sacro-iliacs, elbow and several cases of tuberculous dactylitis. When his paper was completed the evening's interest was only well started for the discussion developed and continued for a longer time than the presentation of the paper had consumed. Dr. McPherson's presentation caused a great deal of interest as many of the cases were known to many clinicians who were present.

Letters, Notes and Queries

Tick Paralysis in British Columbia

To the Editor:

I sincerely hope that medical men throughout Canada will read Messrs. Mail and Gregson's article on Tick Paralysis (*Canad. Med. Ass. J.*, 1938, **39**: 532) with more significant interest.

Two articles which appeared recently in the *Journal of the American Medical Association* show that the disease may appear in any part of the Continent. In the number issued September 10, 1938, page 1008, there is a description of a case of tick paralysis which occurred in South Carolina. In this case the tick found was described only as a wood tick. But in the *Journal* which appeared in the following week, September 17, 1938, on page 1093 there is a description of another case which occurred in Georgia. The significant point here is that wood ticks causing the disease were identified as *Dermacentor variabilis*—the dog tick. This tick is prevalent over the greater part of the North American Continent. Another point well worth mentioning is that the author of the last article says: "It is suspected that other cases have occurred which may have been mistaken for infantile paralysis".

Yours very truly,
R. B. JENKINS, M.D.,
Chief,
Division of Epidemiology.

Ottawa,
December 17, 1938.

Topics of Current Interest

The Eighth Annual Report of the National Radium Trust and Radium Commission

Treatment of cancer by massive radium units, each containing at least 1 to 5 grams of the world's rarest substance, is being launched on a national scale in England, Scotland and Wales, under the direction of the National Radium Trust and Radium Commission.

By the initial acquisition of ten grams of radium from Eldorado Gold Mines "an open and coordinated attack upon cancer" will be made by employing radium beam therapy at 23 clinic centres. Allotments of radium to some of these centres have been made by the Commission. (Because of the immediate need for more radium at other centres, a further 10 grams from the Eldorado company is being secured.)

Preliminary treatment of cancer by the beam therapy method, using powerful radium units encased in massive lead containers, has given

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Answers to letters appearing in this column should be sent to the Editor, 3640 University Street, Montreal.

such results that its adoption as a "recognized therapeutic procedure" is warranted. Because of this "it is recognized that if this method of treatment is beneficial any delay in meeting demands for additional installation of suitable units is unjustifiable".

"It is evident that if the Trust and Commission are to continue their work effectively large additions to their financial resources are imperative and will almost undoubtedly involve an appeal to the government. In this connection, the report states: "The Commission believes that there had never been a more favourable time for an open and coordinated attack upon cancer, and is confident that such an attack under the ægis of the Government would obtain immediate support from the laity, from the hospitals, both voluntary and statutory, and from universities and colleges of surgeons and physicians."

"It might have been added that such an attack would have the most wholehearted support of the medical profession generally, and indeed it is only by its support and assistance that the laity can be induced to realize the widespread benefits which would result from such concerted and systematic action."

The Commission's twenty-three centres are composed of 13 national centres (teaching hospitals to which radium is loaned), 9 regional centres and 1 recognized hospital (a hospital at which "the radium department is recognized . . . as carrying on work at a high standard of efficiency but having no radium on loan from the Commission). After then quoting the report's recommendation that these centres should have at least 300 beds, treat at least 400 new cases a year, and each have available from 3 to 5 grams of radium, the *British Medical Journal* discusses the Commission's statement that radium therapists in charge of treatment must be men of highest standing, ranking with the honorary members of the hospital staffs, and under no condition considered an adjunct to the surgery department. Stating that "The status of the radiotherapist is indeed of so much importance that we shall probably refer to it again at no very distant date", the *Journal* states that it has become increasingly difficult to find the persons "of very unusual scientific and medical or surgical attainments" required for the work. For this reason, it urges, the medical profession should encourage the entry of men of such qualities into this special field.

"Notwithstanding the very obvious difficulties," the *Journal* states, "we believe that with the assistance of the medical profession throughout the country the ideal will be realized. We have always been legitimately proud of the high standard of our clinical work, and it would be a very serious departure from our established standard if anything were left undone for the relief of sufferers from cancer. This is not an academic question of cancer research, but of the application of approved and known methods of treatment, while at the same time the coordination of all available facilities gives the best chances of systematic and thorough investigation."—A Digest of the Report in *Brit. M. J.*, 1937, **2**: 1290.

Abstracts from Current Literature

Medicine

Infarction of the Lateral Wall of the Left Ventricle: Electrocardiographic Characteristics. Wood, F. C., Wolferth, C. C. and Bellet, S.: *Am. Heart J.*, 1938, **16**: 387.

The authors' present detailed reports on 25 cases, suggesting from their observations that (1) acute infarctions in the left lateral wall of the heart produce in the electrocardiogram a depression of the R S-T interval in Lead IV and usually a depression of this interval in Leads I and II, Lead III showing no characteristic abnormalities. (2) Digitalis administration may produce an electrocardiographic pattern similar to that of lateral infarction; (3) this group of patients has a very high incidence of auricular fibrillation. (4) The electrocardiographic features of the acute lesion may subside very rapidly and after R S-T interval deviations disappear the lesion becomes unrecognizable electrocardiographically. (5) The R S-T interval deviation in Lead IV is often more marked when the precordial electrode is placed at or to the left of the apex than when it is put nearer the sternum. (6) The Q R S complex is usually unaffected by lateral infarction. (7) On the basis of electrocardiographic study during the acute stage, it is possible to classify most large infarcts as anterior, posterior, lateral, or combinations of these three types. W. H. HATFIELD

Concerning the Differentiation between Bronchial Asthma vs. Cardiac Disease, and Possible Ill Effects from the Administration of Excessive Amounts of Epinephrine in the former Condition. Smith, F. M. and Paul, W. D.: *Ann. Int. Med.*, 1938, **12**: 585.

Cases of bronchial asthma are not infrequently encountered in which it is extremely difficult to rule out a cardiac factor. The associated emphysema results in a lowered vital capacity, with shortness of breath on exertion, increased venous pressure, and dependent œdema. One gets the impression from the literature that bronchial asthma and left ventricular failure rarely coexist. Swineford and Magruder, however, have recently reported 21 cases in which they did. They advance the theory that the addition of wheezing to paroxysmal dyspnœa in evident cardiac disease is an indication that the patient is allergic, and

that the onset of asthma is provoked by the pulmonary congestion incident to failure of the left ventricle.

There are reasons for believing that the function of the heart may be impaired by the therapeutic use of excessive amounts of epinephrine. Myocardial lesions have been produced in rabbits by its intravenous injection. There seems to be convincing experimental evidence that it has a constricting effect on the coronary vessels, producing electrocardiographic changes in animals, and angina pectoris in patients so predisposed. Theophylline ethylenediamine, commonly prescribed because of its action on the coronary vessels, and one of the most effective remedies in the treatment of acute left ventricular failure, has also a favourable effect on the bronchial obstruction in asthma. Employed as an emergency measure in cases in which epinephrine has failed to give relief, it usually gives prompt, complete and persistent relief. It is used intravenously, 0.48 gm. in a solution of 50 per cent glucose. After the use of theophylline ethylenediamine, the usual response to epinephrine is restored.

H. GODFREY BIRD

Pneumonia Complicated by Acute Pneumococcic Hæmorrhagic Ulcerative Gastroenteritis (Dieulafoy's Erosion). Sandford, C. H., Hughes, J. H. and Weems, J.: *Arch. Int. Med.*, 1938, **62**: 597.

This complication of pneumonia is usually not mentioned in descriptions of the disease, although not as rare as this would suggest. Two cases were reported by Dieulafoy in 1899, in which the symptoms were severe abdominal pain, hæmatemesis and melæna, usually accompanied by a fall in temperature and blood pressure, with weak pulse and extreme prostration. In the present article two cases are reported with one autopsy, which showed the customary findings of lobar pneumonia with empyema, but also an ulcer in the stomach with an eroded blood vessel. The ulcer was 4 cm. in diameter with some smaller ulcers in the vicinity. Both cases showed Type IV pneumococcus.

P. M. MACDONNELL

Surgery

Tuberculosis of the Stomach. Claggett, O. T. and Walters, W.: *Arch. Surg.*, 1938, **37**: 505.

Tuberculosis of the stomach is a comparatively rare condition. The routes of infection may be (1) through the mucosa (direct infection); (2) through the blood stream; (3) through the lymphatic stream; and (4) by continuity and contiguity of structure. Undoubtedly the stomach is highly immune to infection. Infection seldom occurs through the intact mucosa; it occurs through erosion, ecchymosis, gastritis, ulcer and carcinoma, which, under some conditions, can provide portals of entry for the infection. Retrograde lymphatic infection from the mediastinal to the perigastric lymph nodes apparently occurs not infrequently. The most common route is the blood stream. The remarkable resistance of the stomach to tuberculous infection has been variously attributed to the following factors: (1) the effect of gastric juice on the tubercle bacilli; (2) the scarcity of the lymph follicles and lymphatics in the walls of the stomach; (3) the rapid emptying time of the stomach; (4) the integrity of the gastric mucous membrane; and (5) resistance of the muscular tissue to tuberculous infection. Rapid emptying time of the stomach is undoubtedly a factor of importance.

Biernath's classification of the pathological varieties is as complete as can be desired. They are as follows: (1) simple gastritis in phthisical patients; (2) multiple small erosions and ulcers of the mucosa; (3) an ulcerating type; (4) a hypertrophic infiltrating form; (5) a sclerosing inflammatory type; (6) acute miliary dissemination; and (7) extragastric forms of tuberculosis which involve the stomach. The first type may give rise to any of the other types. The ulcerating type is present in at least 80 per cent of cases; in approximately 10 per cent the disease is associated with carcinoma. Clinically, tuberculosis of the stomach closely simulates peptic ulcer, gastric carcinoma and gastric syphilis. A positive examination can only be made following histological examination and by the demonstration of the tubercle bacillus in the lesions. The treatment should always be surgical. Resection of the involved portion of the stomach is the operative choice whenever possible.

G. E. LEARMONTH

Endometriosis of the Umbilicus. Boggs, R.: *Arch. Surg.*, 1938, **37**: 642.

Endometriosis presents a problem for the general surgeon when the site of the disease is the umbilicus. The author reports a case, also 96 cases from the literature in chronological order.

Even though the presence of the uterus-like tissues in the umbilicus is recognized, there must be some stimulating factor to produce endometriosis. Strongin stated that these tissues begin to function when stimulated by hormonal activity (probably gonadotropic) caused by the removal of some inactivating factors. Endometriosis always occurs during the years of ovarian activity. The cyclic nature of the symptoms, corresponding to the menstrual periods, will usually suggest endometriosis. Any or all of the following symptoms and signs may be present: secretion of blood-tinged fluid, pain around or in the umbilicus, tenderness, swelling, itching, bluish discoloration. The tumours usually reach full size in from two to six months, and they range from 1 to 3 cm. in diameter. The treatment of election is wide excision, and the technique is that for ventral hernia. Some authors have recommended exploration of the

peritoneal cavity for further foci of implantation. Roentgen and radium irradiation may be used during the menopausal period to inactivate the ovary. G. E. LEARMONTH

On Post-cholecystectomy Colics. Nygaard, K. K.: *Acta Chirur. Scand.*, 1938, **81**: 309.

Much has been written on this complaint. Hellstrom, in a review of 1,041 cases of cholecystectomy, had 30 per cent of the patients return with the post-cholecystectomy colic syndrome. He describes this as occurring chiefly in women of "neurotic tendencies", with pain varying in frequency and severity and duration in the epigastrium or right upper quadrant without the positive findings of chills, fever, jaundice or leucocytosis. The majority of cases occur soon after operation, while a few returned weeks to months afterwards. In 9 cases common duct stone was found, in 3 or 4 pancreatitis, and the remainder he regarded as functional contraction of the sphincter of Oddi. Others have reported the findings of incomplete cholecystectomy, hepatitis, cholangitis and stricture of the bile ducts. The occurrence of this syndrome can possibly be attributed to poor selection of cases for operation and erroneous diagnosis. The author suggests the spasticity may be one clinical manifestation of a "general nervous hyper-reaction". Clinical experience has manifested its appearance after injections of morphine, pantopon, pilocarpine, caffeine and atropine. It may be relieved promptly by amyl nitrite, but more prolonged relief is obtained from nitroglycerine. The author suggests the use of these drugs in cases of suspected and proved cholelithiasis. The post-cholecystectomy colic syndrome is usually found only after operation. The syndrome is undoubtedly due to the increased intra-ductal pressure necessary to overcome the contraction of the sphincter which may rise to as high as 675 millimetres of water. FRANK DORRANCE

Obstetrics and Gynæcology

The Cycle of the Woman. Samuels, J.: *J. Obst. & Gyn. of Brit. Emp.*, 1938, **45**: 291.

The author has given us a new conception about ovulation and times of capable conception, and has attempted to show by cyclograms taken at different periods of the cycle that the much disputed time of ovulation, as shown by references to many notable experimental gynæcologists, can be probably explained by the fact that more than one ovulation occurs each month and therefore the balance between the folliculin influence and corpus luteum influence fluctuates, reaching the highest influence of corpus luteum effect about six days after maturation of the second ovum, which he claims could occur about twelve days after ovulation of the first ovum. The cycle normally runs 26 to 28 days, or 30 to 31 days. Conception may occur shortly after the first ovulation, but again another ovum may conceive after its ovulation. A few young women are capable of producing three ovulations per month, thus again altering cyclogram findings. The ripening of the first ovum supresses the formation of the corpus luteum of the first ovum by means of a hormone. A sudden drop in folliculin may cause intermenstrual bleeding. A human ovum is capable of fertilization for, at most, two days. A spermatozoon can live two to three days; therefore it is calculated from the cyclograms that a woman is absolutely sterile for three days after the second ovulation declines until two to three days after menstruation. After this she is relatively sterile until three days after the first ovulation declines. The cycloscope with the cyclogram charts will prove to be an indispensible instrument not only for gynæcologists but also for all general practitioners in medicine.

P. J. KEARNS

Hyperemesis Gravidarum. Fitzgerald, J. E. and Webster, A.: *Am. J. Obst. & Gyn.*, 1938, **36**: 460.

In 396 cases reviewed there were 15 deaths and 32 therapeutic abortions. Colour, age, parity and marital state seemed to have no influence on the course of the disease. Persistent tachycardia, fever, diacetic acid and acetone are danger signals. Ability to retain food and fluids in seriously ill patients is not necessarily a sign of improvement. Deaths from hyperemesis are avoidable. The majority of this group responded promptly to rest, diet, glucose therapy and fluids. Those who fail to respond to adequate treatment in a reasonable length of time should have abortion performed. Therapeutic abortions delayed too long are not life-saving measures. ROSS MITCHELL

The Etiology of Thrombosis and Embolism. Dougal, D.: *J. Obst. & Gyn. of Brit. Emp.*, 1938, **45**: 425.

The author has made an extensive research into the factors which may cause thrombosis, and has quoted many experimental results. He classifies the etiological factors as follows: Primary factors: (1) Destruction of tissue and its subsequent absorption. (2) Sepsis. Secondary factors: (1) Changes in the blood. (2) Slowing in the circulation. (3) Changes in the vessel wall.

The incidence following pregnancy is about 0.86 per cent, after gynæcological operations, about 2.9 per cent. Abdominal hysterectomy for fibroids of the uterus claimed about 75 per cent of the cases of thrombosis following gynæcological operations. Extensive repairs of the pelvic floor also claim a high percentage of cases. Total hysterectomy affords an escape of tissue juices through the incision, giving better drainage and less incidence of thrombosis than sub-total hysterectomies. The clot originates

usually in the pelvic, iliac, or femoral veins, and the majority of the cases are of occult type. Most of these cases terminate fatally. Most cases of thrombosis show a slight rise in temperature and pulse before the thrombus is identified. Advanced age seems to be a contributory factor. Most cases were noticed between 50 and 60 years. The average weight of the patients was 168 pounds. In the Mayo clinic, where 63,573 operations were performed, 47 cases of fatal embolism followed; 36 were pulmonary, 10 cerebral, 1 cardiac. The author does not go into detailed treatment.

P. J. KEARNS

Pædiatrics

Oxygen Therapy by the Open Box Method. Patchman, D.: *J. Pæd.*, 1938, **13**: 902.

The open-box method of administering oxygen in children has been advocated previously by Burgess and has proved to be very effective. The explanation of the high concentrations of O_2 obtainable in the box, even though it is open to the air, is that oxygen is slightly heavier than air and when cooled tends to sink to the bottom. Thus it is possible to maintain a balance between the inflow of oxygen and its diffusion upward. With an oxygen flow of 4 to 5 litres per minute concentrations of between 45 to 60 per cent oxygen were constantly maintained in the atmosphere of the box. This compares very favourably with figures recently quoted by Christie for various types of tents and masks. The cost of construction of such a box is about $10 and of the oxygen flowmeter $55. Such an apparatus is portable and so simple to operate that it can be used in the home without specially trained help. Children can be fed, nursed and examined easily without removal from the box. Since clear vision is allowed and the face is not completely enclosed, the children are not frightened and seldom fight the treatment. REGINALD A. WILSON

Comparative Study of the Tuberculin Patch Test and the Mantoux Intracutaneous Test. Vollmer, H. and Goldberger, E. W.: *Am. J. Dis. of Child.*, 1938, **56**: 584.

The authors have been interested in the development of a patch test for tuberculosis which has obvious advantages over the intracutaneous or scratch methods if it should prove to be reasonably reliable. The technique consists of using a synthetic medium (Siebert's) which is about four times stronger than the old tuberculin which they used in their earlier experiments, and of impregnating two squares of filter paper on each strip of adhesive tape instead of a single square.

Of 169 children with active tuberculosis only one failed to react positively with the tuberculin patch test who reacted positively to the Mantoux test with the stronger solution of purified protein derivative.

Among 118 children admitted to the wards with various diseases the Mantoux test, even with 1 mg. of old tuberculin, did not reveal a single case of tuberculous infection which had not already been discovered by the tuberculin patch test. FRANK G. PEDLEY

Therapeutics

Vaccines and the Common Cold. Emdleton, D.: *The Practitioner*, 1938, **141**: 725.

Prophylactic immunization against the common cold and influenza has not been so successful as that against the enteric group; in fact, some large scale experiments have been fruitless. Several reasons may account for this. (1) The infective agent is a virus and bacteria hold second place. (2) "Basic immunity" present in some patients is entirely lacking in others. (3) The value of the immunizing substance in vaccines is quite variable. Primary cultures are the best. (4) Immunization is difficult during an epidemic. There is always a temporary lowering of resistance after vaccine has been given. (5) Many cases are quite unsuitable owing to vasomotor rhinitis or grave metabolic disorder. Violent reactions may follow a very small dose of vaccine if the patient has asthma, sinus infection, or urticaria. Psoriasis may be turned into severe exfoliative dermatitis.

Authorities differ as to the value of vaccine. Some prefer to start with a stock preparation but others demand that it be autogenous from the start. The presence of a deviated septum or infected tonsils should be pointed out as an ever-open door for new organisms.

Tables of suggested courses are given. The majority of workers agree that the following organisms be used in equal parts for a vaccine; pneumococcus, influenza bacteria, *S. viridans*, *Micrococcus catarrhalis*, and staphylococcus. No guarantee of complete immunity is to be given.

C. R. BOURNE

Treatment of Hæmorrhagic Tendency in Jaundice, with Special Reference to Vitamin K. Snell, A. M., Butt, H. R. and Osterberg, A. E.: *Am. J. Digest. Dis.*, 1938, **5**: 590.

Snell and his co-workers administered to more than 30 patients, most of whom had obstructive jaundice, from 200 to 1,000 mg. of concentrates containing vitamin K prepared from putrefied fish meal, together with bile salts or human bile obtained from a biliary fistula. The bile or bile salts were mixed with cold pineapple juice and given by mouth in doses of from 75 to 100 c.c. before each meal. A typical response of both prothrombin time and the concentration of prothrombin to vitamin K and bile when administered together has been obtained repeatedly. The prothrombin time decreased to within nor-

mal limits within a period of from 24 to 72 hours, and the prothrombin itself showed a quantitative increase. Active bleeding has at the same time been controlled in several instances. It appears that the vitamin alone will not accomplish this result if bile is excluded from the intestine, while bile or bile salts have some definite effect, presumably because these substances facilitate absorption of the vitamin which is already in the intestinal tract. In the presence of injury of the liver larger amounts of vitamin K are required to achieve the desired effect. Presumably the chemical laws governing mass action are operative in this connection. This treatment offers considerable hope for the ultimate control of the hæmorrhagic diathesis in jaundiced persons. S. R. TOWNSEND

Pathology and Experimental Medicine

Congenital Pyloric Stenosis in First and Second Cousins. Cockayne, E. A.: *Arch. Dis. Child.*, 1938, **13**: 249.

In this interesting article Cockayne reports 4 families in which pyloric stenosis occurred in cousins, showing that there is a definite hereditary background to the condition. The first family history he records is of 5 sisters who all had children. Two of these sisters each had one son with pyloric stenosis; the diagnosis was confirmed at operation. In the second family there were 2 brothers and 4 sisters. One sister had had pylorospasm as an infant and had been treated successfully medically. She had 3 daughters, one of whom had definite pyloric stenosis, proved at operation, from which she died. A second sister had a daughter with pylorospasm treated medically and a son with pyloric stenosis for which an operation was done. In the third family a sister and a brother each had a son with pyloric stenosis. In the fourth family a girl and a boy both had pyloric stenosis. They were second cousins. He refers also to Halbertsma's family in which a brother and sister, their father's brother, and their father's sister's two sons all had pyloric stenosis; that is 4 first cousins and their uncle were affected.

Cockayne concludes that the defect cannot be a sex-linked recessive, as hæmophilia is, for example. The rarity of consanguineous matings in the parents of these affected children makes it improbable that a sex-linked and autosomal factors are responsible. He feels that "an incompletely dominant gene with partial sex limitation would give results like those actually found".

NOTE.—The practical application of such a study is that families in which this condition has appeared in the offspring are apt to have others, either brothers and sisters, or cousins, similarly affected. This should make the diagnosis easier to make in subsequent children, once the disease has appeared in a family, and to make possible the earliest institution of proper treatment.

MADGE THURLOW MACKLIN

The Control of Renal Blood-flow and Glomerular Filtration in Normal Man. Chasis, H., Ranges, H. A., Goldring, W. and Smith, H. W.: *J. Clin. Investigation*, 1938, **17**: 683.

These authors followed the diodrast, phenol red, and insulin clearances in normal man under a variety of experimental conditions. They present evidence to show that so long as the phenol red/diodrast clearance ratio varies inversely with the absolute clearances it can be assumed that tubular activity is normal and that the clearance method of measuring the effective renal blood-flow is valid.

Data are presented which throw light on the physiological regulation of the renal blood-flow and the rate of glomerular filtration. These data are drawn from observations on water-diuresis and the action of oil of juniper, adrenin, theophylline, caffeine, and sodium nitrite, and during the pyrexial reaction induced by the intravenous administration of typhoid vaccine. The renal blood-flow appears to be controlled predominantly by the efferent glomerular arterioles, these arterioles being normally partially constricted. Since with such efferent control an increase or decrease in renal flow is accompanied by an inverse change in filtration pressure, the filtration fraction varies inversely to, and the filtration rate tends to be independent of, the renal blood flow.

JOHN NICHOLLS

A Study of the Chest Leads of the Electrocardiogram with an Evaluation of the Positions of the Precordial Electrode. Edwards, J. C. and Van der Veer, J. B.: *Am. Heart J.*, 1938, **16**: 431.

This study was made in an endeavour to elucidate the variation noted in precordial leads and to evaluate the new precordial leads (IV R, IV F, and IV L) recently recommended by the committees of the American and British Heart Association. Multiple precordial leads were made in a series of 67 patients. The studies suggest that ordinarily it is desirable to place the precordial electrode at the position of the apex (mid-clavicular line fifth left interspace) in normal or only slightly enlarged hearts. However, in the case of patients with moderately or greatly enlarged hearts the electrocardiogram will more often substantiate the clinical diagnosis if the precordial electrode is placed medial to the apex and never farther to the left than the anterior axillary line. It is indicated that for the best results cases will have to be individualized, and perhaps more than one position utilized in many instances. In pericarditis and infarction of the lateral wall of the left ventricle no one lead appears

to give completely satisfactory results, and in cases of this type exploration of several precordial areas is often indicated. W. H. HATFIELD

Radiology and Physiotherapy

Cancer of the Larynx. Coutard, H.: *Am. J. Roentgenol. & Rad. Therapy,* 1938, **40**: 509.

This article is written not as a method of treatment but as a summary of the results of various types of treatment by the Coutard method in relation to cancer of the larynx, and in his classifications the author attempts to show by chart and table the yearly survivors of cases treated with special reference to the five- and ten-year period. Due to the intolerance for high total doses during a short time an attempt was made to treat these cases with a small number of "r" units daily over a continuous large number of days or in two series of treatments divided by a period of rest from ten to fifteen days, which proved more satisfactory than when these cases received fairly large dosage for three or four days, the dosage being reduced to smaller exposure for the following days. In other cases an increase in the daily dose was given at the end of a condensed treatment and this proved more favourable. It is also shown through these treatments that there are three factors to be considered in treatment of cancer of the larynx—the total dose, the daily dose, and the moment of distribution of certain daily doses. It also shows the effects of the irradiation of cancers of both the undifferentiated and the differentiated type of cells, so that the more the cancer is differentiated, the later the epithelicidal effects appear, and his observation has led him to the conception of two general forms of roentgen therapy: (1) Quantitative roentgen therapy, which is simple and elementary, in which the total dose and the continuous treatment are the principal factors; (2) qualitative roentgen therapy, which is physiological, and in which the high daily doses given at opportune moments constitute together with their discontinuity the two principal factors. H. H. CHENEY

Roentgen Diagnosis of Tumour of the Kidney. Renander, A.: *Acta Chirurg. Scand.,* 1938, **81**: 379.

In going over the records of 24 cases of tumour the author found considerable discrepancy between the x-ray diagnosis and the operative findings. He came to the conclusion that the absence of pelvic deformity was due more to infiltration than to expansion. Intravenous and retrograde pyelography have their value in the diagnosis. The kidney shadow was more often enlarged. The deformation of the renal pelvis found expression in various alterations of the shape of the calyces, either as lengthenings or shortenings, as total or partial compressions, as secondary dilatations or as dislocations or pushing apart of the calyces; this is particularly true of the hypernephromas. An antero-posterior compression of the pelvis was also found and occasionally a filling defect of the pelvis. FRANK DORRANCE

Anæsthesia

Cyclopropane as a Supplementary Anæsthetic to Subdural Block. Weinstein, M.: *Current Research. in Anæs. & Anal.,* 1938, **17**: 352.

The author recognizes the disadvantages accompanying spinal anæsthesia in that the duration of the operation in some cases may outlast the action of the anæsthetic agent. This is particularly the case in which novocaine in moderate doses is employed. There are several indications for supplementing spinal anæsthesia. The first and largest group includes operations on the stomach and colon, urological operations, and so forth, where one and one-half to two hours may be necessary to complete the operation. Secondly, additional anæsthetic may be necessary for inadequate spinal anæsthesia due either to too low a spinal block or insufficient sensory and motor nerve anæsthetization. Thirdly, a supplementary anæsthesia may be required in instances where spinal anæsthesia is induced with difficulty due to anatomical distortion of the spine or obesity of the patient. A diffusion of some of the solution outside of the subdural space then results, and pain is experienced much sooner than expected. Lastly, occasions arise during spinal anæsthesia when a small concentration of a gaseous anæsthetic and a large supply of oxygen may be advantageous. This includes instances of nausea and retching during traction on viscera, or exploration above the fully anæsthetized levels.

Cyclopropane is a gas capable of administration with a concentration of oxygen as high as 80 and 85 per cent. This is a distinct advantage where one is dealing with a shocked and anoxæmic patient, as is often the case with spinal anæsthesia requiring a supplementary anæsthesia to complete the operation. The supplementary anæsthetic should be of such a value as to allow rapid and smooth induction without increasing want of oxygen. Unlike nitrous oxide and ethylene, cyclopropane fulfils this requirement and also permits a maximum supply of oxygen with adequate anæsthetizing concentration of the gas. Ether is always available and relatively safe, especially when given along with oxygen, but presents difficulties attendant upon longer induction time. With our present anæsthetic facilities, it would appear that cyclopropane is the anæsthetic of choice where a supplementary anæsthetic is required for a subdural block.

F. ARTHUR H. WILKINSON

Hygiene and Public Health

Erythema Nodosum and Tuberculosis. Brandon, K. F., Hardman, R. P. and Birks, W. H.: *Canad. Pub. Health J.*, 1938, **29**: 533.

An epidemic of erythema nodosum appeared in a boys' school in the spring of 1936. Thirteen cases occurred within 7 weeks and a 14th at a later period. Prior to the outbreak the staff did not recall the occurrence of a single case and none appeared in the school medical records. The living quarters of the boys were in 5 cottages, but there was a common dining room, and in their classes and vocational training there was opportunity for direct contact.

The clinical course was associated with the typical nodules and fever. The duration of the fever was from 3 to 22 days, the most common period being 10 days. None of the cases gave a history of tonsillitis within the preceding month. All gave a positive tuberculin reaction. The majority of the well boys were also tested with tuberculin; 87 per cent of these reacted positively. The tubercle bacillus was not isolated from the blood or from the nodules, but the complement fixation and inhibitive reactions were very suggestive in at least 6 of the 11 patients examined.

The authors consider that the evidence points strongly to tuberculosis as a cause for this outbreak. A review of some other outbreaks is given.

FRANK G. PEDLEY

A Study of the Economics of Pneumonia: the Costs of Diagnosis and Treatment of 625 Cases in New York City. Hirsh, J.: *Pub. Health Rep.*, 1938, **53**: 2153.

The author undertook to determine and tabulate the cost of treating 625 pneumonia cases in New York City. All cases had been treated since September, 1934.

The items which were considered as entering into the estimate of cost were: (1) hospital care at $3.50, $5.50 and $8.00 per day for public, semi-private and private accommodation; (2) physician's services, estimated at $2.00, $3.00, and $5.00 per visit for the three types of accommodation; (3) serum cost, estimated per 25,000 units at $7.00, $9.00 and $12.00; and (4) other services. The average cost per patient for all types of care was $167.60, but, on account of the wide spread, the median figure of $134.16 is considered more representative. For public ward cases the median cost was $123.64 and the modal or most frequent cost was about the same figure.

Physician's services comprised 22 per cent of the cost of public ward treatment. This represented a contribution on the part of the physicians, since they received no remuneration for their services to this type of patient.

The average cost of serum for the 195 public ward patients who received serum, was $70.00.

FRANK G. PEDLEY

Obituaries

Professor Thomas Wingate Todd died on December 28th in his fifty-fourth year, after a long and distinguished career. He was born in Sheffield, England, on January 15th, 1885, and held the degrees of M.B., Ch.B. Manchester, '07. He received his early anatomical training in Manchester, partly under Professor Grafton Elliot Smith, being in turn Demonstrator ('07-'08), Senior Demonstrator ('08-'09) and Lecturer ('10-'12). He then, in 1912, at the early age of 27, was appointed Henry Willson Payne Professor of Anatomy at the Western Reserve University in Cleveland, Ohio, and also Director of the Hamann Museum of Comparative Anthropology and Anatomy and he held these positions until his death. At Cleveland he spent just half his life, and this was a period of extraordinary activity. He not only taught anatomy to the regular classes of medical students but was constantly under requisition for lectures in various parts of the continent. His was one of the most active research Departments of Anatomy in the world, and from it came a constant stream of valuable scientific publications in the field of the morphological sciences. He was particularly interested in problems of growth, and child development engaged much of his attention. As a writer he had a keen incisive style, often lighted up by quotations from the great literary masters. He was unusually hospitable, and in his laboratory were almost always to be found guests, who were given the freedom of the Department and were made to feel at home. Some of the world's greatest anatomists, such as Elliot Smith, were glad to enjoy the privileges of his fellowship. Such an indefatigable worker was he that he sometimes spent the night on his couch in his laboratory. Prof. Todd was Chairman of the Brush Foundation, and its director of inquiry; and was a member of the Board of Managers of the Charles B. Bolton Fund. He belonged to the American Association for the Advancement of Science, and served as Vice-president of Section H in 1933. He was one of the best known members of the American Association of Anatomists, and in 1925 acted as host to the Association at one of its most successful meetings in Cleveland. He was elected a Vice-president of this Association in 1920, and again in 1938, and so held this position at the time of his death. He was also a member of the Anthropological Association, of the Association of Physical Anthropologists (serving as its President in 1938); a Fellow of the Galton Society; a member of the Anatomical Society of Great Britain and Ireland (Councillor, 1912); a Fellow of the Royal College of Surgeons, a corresponding member of the Zoological Society of London, a corresponding member of the Society of Anthropologists of Paris, and of the Royal Academy of Medicine of Belgium.

During the Great War he came to London, Ont., and served as an officer of the Canadian Army Medical Corps with the rank of Captain. He was medical officer to the C.E.F. and was stationed at the Wolseley Barracks in that city.

Todd was a man whose unbounded enthusiasm, unquenchable good nature, fine generosity, ready wit, uncanny capacity for making friends, sociability, and that indefinable something that maketh a great personality made him known and loved by thousands. He was one of the best known and esteemed anatomical scientists and anthropologists on this Continent and in Europe, and his death will be very widely mourned. To this man Nature had, indeed, given rare gifts of heart and mind, and he returned the fruits of these in full measure and with interest to his fellow men.

CHARLES C. MACKLIN

Dr. J. A. E. Beaudoin, of Montreal, former M.L.A. for St. James, died suddenly on January 7, 1939, at the age of 73. He was born at St. Ambroise de Kildare, county of Joliette, a son of Mr. and Mrs. Eusèbe Beaudoin, was educated at the Joliette Seminary and

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at Laval University, where he graduated with distinction in 1892. He was a former governor of the College of Physicians and Surgeons of the Province of Quebec and of Notre Dame Hospital.

Dr. Charles-Jeremie Coulombe, of St. Justin de Maskinonge, Que., dean of the L'Assomption College Alumni Association, died in his 94th year. Born at St. Cuthbert in 1846, he completed his medical course at Victoria University.

Dr. Frank Cyril Barltrop Campbell, M.O.H. for Owen Sound, Ont., died suddenly early in December, 1938. He was born at Hepworth, Ont., in 1898. He was a graduate of the University of Toronto (1921). He was a specialist in children's diseases and had had wide experience in public health work.

Dr. Charles Whitefield Clark, of Toronto, a homœopathic physician, died on January 8, 1939. He was ninety-three years old and a graduate of the Hahnemann Medical College, Chicago (1866).

Dr. Charles William Haentschel, of Haileybury, Ont., died on December 15, 1938, in his 79th year. He was born in Germany in 1860 and came to Canada with his parents in the year of Confederation, 1867. His boyhood was spent in Pembroke. His education was completed at McGill University, in 1888, where he graduated in medicine and for a number of years he practised his profession at Mattawa. He came to Haileybury thirty-one years ago. In 1909 he was mayor of the town and during subsequent years always took a keen interest in all public affairs.

Dr. Ezra A. Haist, of Ottawa, died on December 12, 1938. He was a native of Ridgeville, Ont., and received his education at St. Catharine's College and graduated in medicine from Toronto University (1895). He had practised in Ottawa for thirty-four years.

Dr. John Clyde MacDonald, of Edmonton, Alta., died on December 28, 1938, in his seventieth year. He was born at Gore, N.S., and a graduate of Dalhousie University (1895). Before going west Dr. MacDonald practised in Westville, N.S. He went to Edmonton in 1912.

Dr. Donald Walter McKay, of Nelson, B.C., died on December 29, 1938. He was born in 1894, and graduated from the University of Toronto in 1918. He was also M.R.C.S. and M.R.C.P. (Eng., 1922) and D.P.H. (Lond., 1923).

Dr. Francis Xavier McPhillips, of Vancouver, B.C., died on December 23, 1938, aged seventy. He was a graduate of the University of Manitoba (1889). Dr. McPhillips was an excellent surgeon and joined the staff of St. Paul's Hospital in 1894. He was responsible for much of the development of that institution.

Dr. James Graham Merrison, of Sarnia, Ont., died on November 24, 1938, aged eighty-five. In addition to having enjoyed an honorable career as a physician, Dr. Merrison rendered valuable services to Sarnia as a member of the city council (ex-mayor). He was born at Hog's Hollow, which is now a part of Toronto, and was brought to Sarnia when he was a year old. He graduated in Medicine in 1878 from Trinity University, Toronto, and later also obtained degrees in Edinburgh and London.

Dr. Merrison started practising in Sombra and later was at Brigden, Deadwood, Colo., and Courtright. He was colonel in command of the First Hussars, which had squadrons in London and Kingsville, in addition to Sarnia, 30 years ago. He had practised in Sarnia for fifty years.

Dr. J. Damase Pagé, of Iberville, Que., died on November 30, 1938. Born in 1861 at St. Casimir de Portneuf, Dr. Pagé was educated at the Quebec and Nicolet seminaries, later attending Laval University, from which he graduated in medicine in 1887.

After his graduation, Dr. Pagé established a practice in Waterloo, Que., where he remained for sixteen years. In 1904, he was appointed medical superintendent of the Immigration Hospital at the Port of Quebec, and during the Great War served as a Major with the Canadian Medical Corps at Quebec City working among returned soldiers. With the creation of the Federal Department of Health in 1920, and the transfer of the Immigration Medical and Quarantine Services to that department, he was appointed chief of the division, and held this office until his retirement in 1932.

Dr. John Mair Robertson, of Vancouver, B.C., died on December 28, 1938. He was born at Galston, Scotland. He was L.R.C.S. (Edin., 1882), and M.B., M.Ch. (Glasgow, 1883). He did post-graduate work at Johns Hopkins University and went to Vancouver in 1911.

Dr. William Brown Thistle, of Toronto, died on December 17, 1938. He had practised in Toronto nearly fifty years. He was the son of Mr. and Mrs. William Thistle, and was born in Stratford, Ont. In 1887 he graduated from the University of Toronto and for some time was engaged in post-graduate work in the Rotunda Hospital in Dublin, Ireland, and in London, England. He was a L.R.C.P. of London, Eng., F.R.C.P., of Canada, a Fellow of the Academy of Medicine in Toronto, and an Honorary Fellow of the Æsculapean Club.

Not only had Dr. Thistle won a wide recognition as a general practitioner, but he was distinguished as a lecturer, demonstrator and consultant. He served at various times on the staff of the Toronto General Hospital, the Hospital for Sick Children and Christie Street Hospital.

Leaving his private practice, he enlisted in the Great War and for four and one-half years served with the Canadian Army Medical Corps as Chief Physician and Medical Consultant at the Base Hospital located in Toronto.

Dr. John Stephen Thompson, of Wintertown, Me., U.S.A., died at St. Martha's Hospital, Antigonish, N.S., on January 8, 1939. Dr. Thompson was born at Cloverdale, N.S. on Christmas Day, 1863. Graduating from St. Francis Xavier University, he studied medicine at Georgetown University (1895), and, after some years in the employ of the United States Government, took up practice in Cambridge, where he continued until his retirement ten years ago. He had returned to his old home when his last illness came upon him.

Dr. Arthur Vallée, secretary of the Faculty of Medicine at Laval University and one of the most prominent French-Canadian physicians in North America, died on January 8, 1939, aged fifty-six, after a short illness.

He was born in Quebec, in the home he occupied until his death, and was the son of the late Dr. Arthur Vallée, professor at Laval, and grandson of the late Hon. P. J. O. Chauveau, first Premier of Quebec. A member of several scientific societies, he received decorations from the British and French Governments and the Holy See.

Dr. Vallée was a graduate of Quebec Seminary and Laval, and studied in Paris before taking up practice in Quebec following his graduation in 1905. He joined the Faculty of Laval in 1907, becoming secretary of the University's Faculty of Medicine the same year.

From 1908 to 1912 he was director of the Municipal Laboratory, after serving as Laboratory head at Hotel-Dieu Hospital. He was chosen president of the

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Eighth Congress of French-speaking Physicians of America in 1916.

Dr. Vallée was created a Chevalier of the Legion of Honour by the French Government in 1925, and received medals from the British Government during the jubilee of King George V and again at the coronation of King George VI.

He was a member of the Royal Society of Canada, the French Association for Study of Cancer, the Royal College of Physicians and Surgeons of Canada, the Canadian Medical Association, and other medical societies. A director of the National Research Council at Ottawa, he also acted as correspondent for the Paris Medical and Hospitals Society. Dr. Vallée was eminent as a litterateur, being perhaps best known for his exhaustive monograph on Michel Sarrazin.

Dr. David Caw Wilson, of Parkhill, Ont., died on December 20, 1938. Dr. Wilson was a son of Thomas Wilson and Mary Caw Wilson, and was born in 1876. He received his early education in Parkhill public and high schools. He graduated from Trinity College in 1898 and started to practise with his uncle, Dr. William Caw, in Parkhill. He went overseas in 1915 and served as a captain in the King's Royal Rifle Corps. He was M.O.H. for McGillivray Township.

News Items

British Empire

The Sixth Australasian Medical Congress will meet in Perth, Western Australia, at the end of August, 1940.

The main theme of Congress is "Rheumatic and Allied Disorders".

It is hoped that one prominent British medical man in each of the Sections of Medicine and Surgery will attend. Other Sections may be similarly honoured.

Each Section has a Secretary appointed from this State and a President who will be a Senior Specialist selected from one of the other States or New Zealand.

This is an excellent opportunity for any desirous of taking a holiday about Congress time. August has been selected as it is the beginning of the wild flower season and also climatic conditions are then at their best.

The other capital cities of Australia—Sydney, Melbourne, etc., will be at most a day's travel by air from Perth. New Zealand should be about 4 days by air and boat.

Any member wishing to participate in any of the discussions should write the Honorary General Secretary.

The President (Dr. D. D. Paton), and Executive Committee extend to the members of the Canadian Medical Association a hearty invitation and will do all in their power to ensure them a warm welcome.

All members of the British Medical Association and Canadian Medical Association are eligible to join the Congress. Non-members must be nominated and approved by the Executive Committee. The Congress fee will probably be £2. 2s. 0d.

Noel M. Cuthbert, "Shell House", Perth, W.A., Honorary General Secretary.

Alberta

The annual elections for representation on the Council of the College of Physicians and Surgeons of Alberta took place December 31st, with the following results. District No. 2, Lethbridge, Dr. J. K. Mulloy, Cardston; No. 4, Camrose, Dr. W. V. Lamb, Camrose; No. 6, Calgary, Dr. R. B. Francis, Calgary. In District No. 2 the former representative, Dr. P. M. Campbell, M.L.A., decided he was too busy to run.

The question of compulsory health insurance has been up for discussion by various professional and lay bodies to such an extent that the Committee of the Canadian Medical Association dealing with the subject has suggested a plebiscite, and to that end we are publishing the plebiscite in the January issue of the *Alberta Medical Bulletin*, expecting that Alberta physicians who have given a great deal of thought to the subject may be able to contribute constructive ideas.

An experiment in local health insurance is being considered by certain municipalities which have already a Health Unit, together with contracts covering hospitalization of all their residents. The plan contemplates a contract with the physicians now rendering medical services, whereby for a certain sum, payable monthly to a committee of physicians, the residents will have choice of doctor, the doctor to have choice of patient and to be paid for services rendered, each man getting his proportion of the amount of money set aside monthly. The matter has not progressed far enough to make the details public.

During the year 1938 there were registered 59 physicians from the following universities: Alberta 24; Manitoba 12; Toronto 10; McGill 5; Queen's 5; Montreal 1; Dalhousie 1; College of Medical Evangelists 1. Thirty-eight of the registrants located in Alberta, most of the others going to Great Britain for post-graduate studies.

During the year 18 registrants died, though only 14 were actually practising in the province at the time of death.

Dr. A. C. McGugan, who was with the Mental Hospital at Ponoka for the last three years, when the province abolished his position, has returned to Edmonton to his old position as Provincial Medical Health Officer.

G. E. LEARMONTH

British Columbia

The British Columbia Cancer Institute is now in full operation as the first (Vancouver) unit in the scheme being developed by the British Columbia Cancer Foundation. Its Board of Management asked the British Columbia Medical Association to submit panels of names for an Active and a Consulting Staff, which will cover every branch of medical work. The former has been submitted, composed of men practising in Vancouver proper, and choice is now being made from this list. The Consulting Staff will be drawn from all parts of British Columbia, and is still in process of selection. Dr. Wallace A. Wilson has also been appointed to the Board of Management as the representative of the British Columbia Medical Association.

Instruction in public health work, to be transmitted to school children throughout the province, will be given to students of the Vancouver Normal School under arrangements made by the Metropolitan Health Committee with the provincial education authorities. Normal School students will receive more advanced training than those of the university, according to Dr. Stewart Murray, Medical Health Officer. The new service will include physical examination of every student. A. G. Harvey, chairman, and Dr. Murray were named to investigate a request from Rev. L. A. Bourrie, Superintendent of Catholic schools, that the public school health services be extended to include the 3,000 children now attending separate schools here.

In an endeavour to check the number of scarlet fever cases in Vancouver, Dr. Stewart Murray, Medical Health Officer, intends to recommend an appropriation in next year's civic budget to provide for public immunization against the disease. The disease has an unfortunately high incidence in Vancouver; so far this year there have been 474 cases in Vancouver, none fatal. If funds are

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Other reported uses of estrogenic substance—such as in the control of atrophic rhinitis,[1] and the treatment of senile vaginitis,[2,3,4,5] chronic cystic mastitis,[6,7,8] and chronic nervous exhaustion,[9] in the opinion of the Council on Pharmacy and Chemistry, A.M.A., must be considered as "not yet adequately defined."

1. *Mortimer, H.; Wright, R. P.; and Collip, J. B.: Canad. M. A. J. 37: 445 (Nov.), 1937.*
2. *Lewis, Robert M.; and Adler, Eleanor, L.: J.A.M.A. 109: 1873 (Dec. 4), 1937.*
3. *Davis, M. E.: Surg., Gynec. & Obst. 61: 680 (Nov.), 1935.*
4. *Jacoby, Adolph; and Rabbiner, Benjamin: Am. J. Obst. & Gynec. 31: 654 (April), 1936.*
5. *Hawkinson, L. F.: J.A.M.A. 111: 390 (July 30), 1938.*
6. *Lewis, Dean; and Geschickter, Charles F.: J.A.M.A. 109: 1894 (Dec. 4), 1937.*
7. *Geschickter, Charles F.: Am. J. Roentgenol. 39: 90 (Jan.), 1938.*
8. *Birnberg, C. H.; Kurzrok, L.; and Livingston, S.: Am. J. Surg. 41: 39 (July), 1938.*
9. *Schneider, Phillip F.: Am. J. Obst. & Gynec. 31: 782 (May), 1936.*

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Manitoba

Dr. Charles F. Code, who graduated M.D. from the University of Manitoba in 1934, has been recently awarded the Theobald Smith prize of One Thousand Dollars by the American Association for the Advancement of Science. The award was made on account of Dr. Code's research work in connection with the problems of allergy.

The Manitoba Hospital Service Association formed for the purpose of providing Group Hospitalization has started operations in Winnipeg. Mr. Peter Klein has been loaned by the Duluth Association to the Manitoba Association and is giving his attention to the successful launching of the scheme.

The monthly charges are 75 cents for individual members and 25 cents additional for family dependants, that is, wife and all children under the age of 19. This amount provides for hospital care up to 21 days, with semi-private accommodation, or $3.00 a day allowance on a private room, if desired. Routine operating-room services without extra charge, usual surgical dressings and usual drugs and medicines are included. Other services, such as laboratory examinations, x-ray, and physical therapy, are also included when ordered by the doctor for the patient in hospital. Maternity care is provided after twelve months' membership.

A strong Board of Trustees has been formed with the following officers: A. L. Crossin, Chairman; W. T. Hunt, Vice-chairman; John McEachern, Treasurer; Dr. E. S. Moorhead, Secretary. The hospitals which are members of the Association are the Winnipeg General, St. Boniface, Misericordia, Grace, Children's, St. Joseph's and Victoria.

According to the report of the Relief Department of the City of Winnipeg the cost of Unemployment Relief in Winnipeg during 1938 was $428,000 below 1937. The total cost including administration and medical care was $3,083,403, as compared with $3,511,859 in 1937. Administration costs total $168,254, an increase of $18,000 over 1937, while medical costs were $125,733, a drop of $31,000. At the end of the year there were 5,358 families, 100 single men, and 1,045 women on relief, a total of 6,503, or 396 below 1937, and 1,620 down from 1936.

Dr. A. J. Douglas, chief Medical Health Officer of Winnipeg, will retire on pension on April 1st after almost 39 years as head of the city Health Department. Under his guidance comprehensive preventive campaigns were undertaken, with the result that Winnipeg today is one of the healthiest cities in the country and has not had a major epidemic for almost 20 years. Among the many services he initiated were free vaccination for children, diphtheria immunization, and baby clinic and milk depots.

At the Special Convocation of the University of Manitoba to celebrate its Sixtieth Anniversary, some two years ago, Dr. Douglas, representing the Faculty of Medicine, received the degree of LL.D. *honoris causa*.

The new Out-Patient Department of the St. Boniface Hospital was formally opened on the evening of January 19th. The new Out-Patient block was erected at a cost of approximately $145,000.00. It is, in a sense, a memorial marking the 200th anniversary of the ideals and activities initiated by the Venerable Mother D'Youville, foundress of the Order of the Grey Nuns. The building will also house the Venereal Clinic of the Provincial Government.

The buildings on the hospital site now are the main hospital building, the St. Roch's Hospital for infectious diseases, the Nurses' Home, and the Out-Patient Department. The new building will provide increased facilities for the instruction of medical students.

ROSS MITCHELL

New Brunswick

On December 6th a team of three speakers from Saint John appeared before the St. Croix Medical Society at St. Stephen. Dr. George White spoke on the "Persistent posterior position as influenced by the Melhado manœuvre". Dr. Norman Skinner presented a paper on gastric ulcer with emphasis on the modern trends in treatments. Dr. J. K. Sullivan discussed very fully the question of nephrolithiasis. There was a large turn-out and discussion was very free.

Dr. Chipman McKay has returned to Saint John and resumed practice after spending almost two years in the study of orthopædics in several clinics in England.

Dr. George Keddy has commenced practice in West St. John.

Dr. F. A. McGrand has been appointed a coroner for Sunbury County.

Dr. R. A. H. Mackeen, Provincial Pathologist, attended the meeting of the Laboratory section of the Canadian Public Health Association at Toronto recently. Dr. Mackeen was appointed Vice-president of the Association. A. STANLEY KIRKLAND

Nova Scotia

Group-hospitalization has become a reality in the County of Antigonish, where St. Martha's Hospital has concluded arrangements with three groups whereby hospital service is given as necessary, in return for the payment of a quarterly fee. The last unit to be enrolled has been formed from St. Ninian's parish, and consists at present of a nucleus of eighty members. A family rate of three dollars per quarter entitles members to five weeks of ward treatment at a time, to each dependent of a family; to a 50 per cent reduction in the rate for private and semi-private rooms; to laboratory services and ordinary medicines; to a 50 per cent reduction on x-ray and operating-room fees. Individual members may enrol under the same conditions for two dollars a quarter. This latest unit is to be known as the Mutual Hospitalization Group.

Dr. Frank Mack (Tor., '14) and Dr. Gordon A. Winfield (Dal., '29), of Halifax, were elected members of the American Urological Association at its last annual meeting in Quebec.

Dr. H. W. Kirkpatrick (Dal., '16) has been elected to membership in the Canadian Ophthalmological Society.

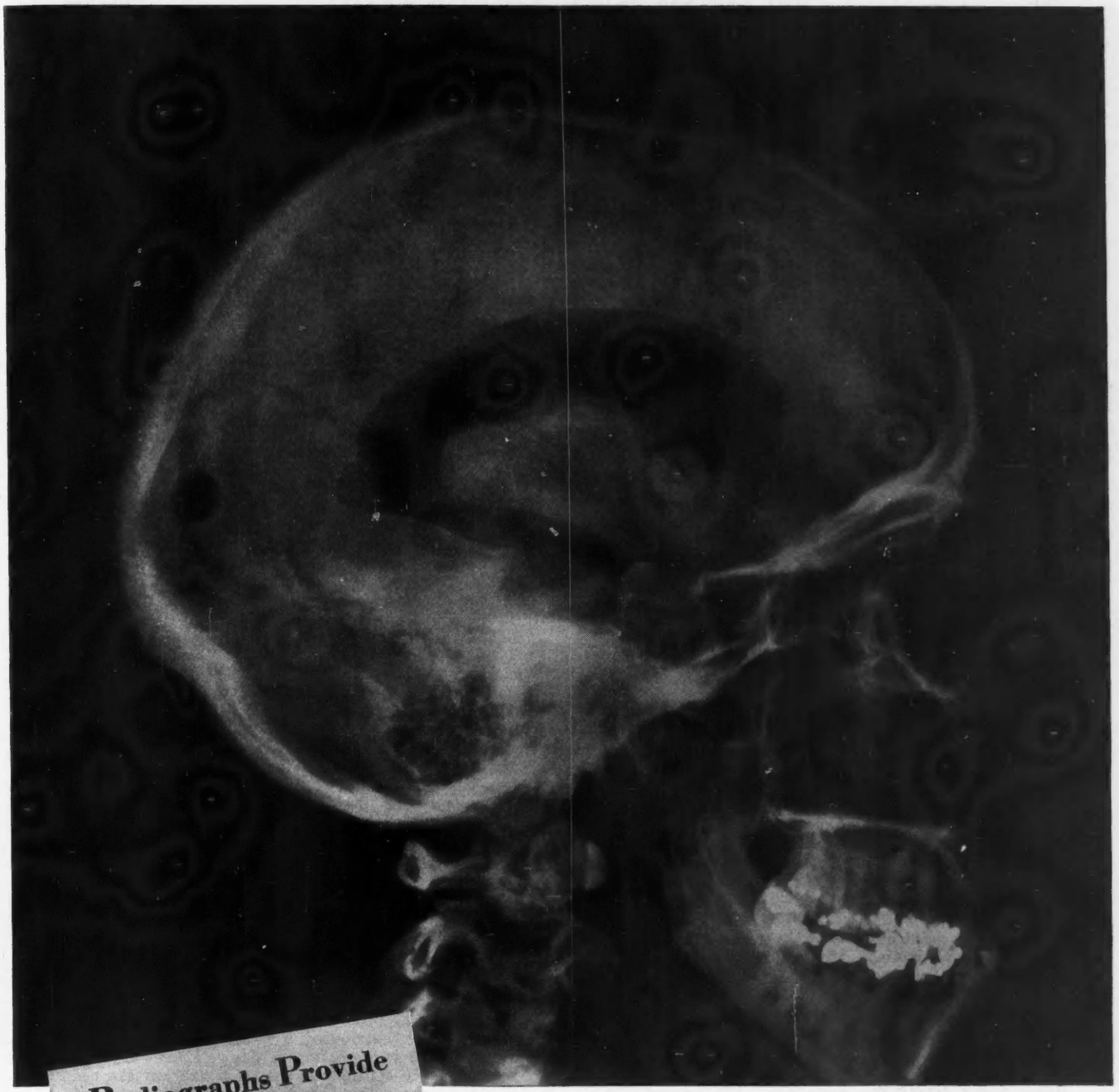
Dr. C. B. Crummey (Dal., '32) has opened an office in New Glasgow.

Dr. and Mrs. Joseph Hayes, of Halifax, recently celebrated their golden wedding anniversary.

Dr. Harold MacKean (Dal., '34) has moved to Glace Bay where he has taken up practice.

Dr. W. W. Bennett (Dal., '33), of New Germany, has sailed for Scotland where he plans to spend the next year in post-graduate study. He is accompanied by Mrs. Bennett. Dr. Bennett's brother, Dr. Sydney Bennett, is taking over his practice.

An outpost nursing station, the first in Nova Scotia, has been opened at Cape North, C.B., one of the outermost corners of Canada. The lodge used for the purpose is completely equipped and has four beds. Miss Anne



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"MEDICAL SCIENCE was provided with a new and precise diagnostic method for examination of organic brain disease, with the introduction by Dandy of the cerebral pneumographic procedures, ventriculography in 1918 and encephalography in 1919. Although relatively recent, it has become one of the most important and widely used diagnostic methods in neurology and neurological surgery."—*Am. J. Roentgenol.*, 36:648, November, 1936.

CANADIAN KODAK CO., LIMITED Toronto, Ontario.

Slattery, a Cape Breton graduate of the Royal Victoria Nursing School and McGill University, has been placed in charge, and the post will be under the direction of Dr. J. S. Munro of North Sydney. ARTHUR L. MURPHY

Ontario

At the annual banquet of the Hippocratic Society of the University of Western Ontario, on December 9th, Dr. A. H. Gordon, Professor of Medicine at McGill University, gave an address on "Some medical snobberies".

At the fifty-first annual meeting of the Hillcrest Convalescent Hospital, Toronto, a year of progress was reported. It is now known as "The Hillcrest Hospital", not *Home*, as formerly. Several rooms have been added, others redesigned and modernized for the comfort of the large number of public and private patients. Two hundred and fifty-six patients were admitted during the year. The hospital days for public ward and private patients showed an increase over the previous year. The Occupational Therapy Department, now almost on a self-supporting basis, has become an important feature of treatment.

At the November meeting of the Harvey Club of London, Sir Frederick Banting spoke on economic and political conditions in Russia.

Dr. Norman B. Gwyn, of Toronto, addressed the Osler Clinical Society of Columbia University, College of Physicians and Surgeons. An interesting feature of this visit was the presentation by Dr. Gwyn, a nephew of Sir William Osler, of a gavel made of wood from the house in which the great physician was born at Bond Head.

The Commission which has been investigating the Ontario Mental Hospitals for the past four months has rendered its report. The Commission was appointed to investigate charges that certain patients had been illegally detained; however, the scope of the enquiry was enlarged early in the deliberations to include the whole administration of the psychiatric institutions of this province.

From the point of view of the medical profession, it is gratifying to quote the following paragraphs as they relate to our colleagues in the Ontario Hospitals Service.

"It is the unanimous opinion of the members of the commission that the Ontario Hospitals are extremely well run, and that the superintendents, physicians and members of the nursing staff are to be congratulated upon the very efficient manner in which they carry out their duties under trying circumstances. We are not in a position to compare the operation of hospitals here with the operation of hospitals in any other province or country, but we are firmly of the opinion that the Ontario Mental Hospitals would stand comparison with any similar institutions any place.

"Apart from a small number of medical certificates of private practitioners which appeared to be inadequate, the files in the institutions indicated great care on the part of those responsible for the committal or admission of patients to mental hospitals.

"We feel that it is only proper that the commission should state after its investigations, in no case does it appear that there has been a wrongful certification or that a patient has been detained longer in an institution than was necessary for his proper treatment."

Among the recommendations contained in the report, the following appear most interesting to the medical profession.

1. That before a magistrate commits a person for observation to an examination unit in a general hospital he should have before him the certificate of one medical practitioner and the certificates of two doctors where commitment is direct to a mental institution.

2. That alcoholics without psychosis should be segregated in one hospital so that a ward could be given over completely to their care.

3. That one central board of review directly responsible to the Minister of Health be established to consider appeals made by patients or relatives against allegedly unwarranted detention, and to have full power to release patients, either by way of probation or discharge.

4. That the Medical Act be amended to legalize the sterilization of a number of women patients now held as mental defectives.

5. That a survey be made of all the paretics in the mental hospitals with a view to housing them under one roof and treating them with "artificial fever".

6. That coroners' investigations of deaths in the mental hospitals be of the fullest possible nature.

7. That the present examination units in the mental hospitals be abandoned, but that arrangements be made as soon as possible to set up similar units in the public general hospitals.

Several of the recommendations, if implemented by legislation, would have the effect of reassuring the public that the interests of the inmates are being adequately protected and of avoiding the possibility of charges, however ill-founded, of unlawful detention. Other recommendations which affect the treatment of patients and the administration of general and special hospitals require careful scrutiny by the legislators and consultation with the medical profession before being translated into law.

The 59th Annual Meeting of the Ontario Medical Association (Canadian Medical Association, Ontario Division) will be held in Hamilton May 29th to June 2nd, 1939. Active committees of the Hamilton Academy of Medicine have the preparation well in hand, so that every member and his wife are assured of a most enjoyable and profitable visit. An outstanding scientific program has been arranged which will provide authoritative presentations designed to interest the general practitioner. We are looking forward to one of the largest medical meetings ever held in this province.

J. H. ELLIOTT

Quebec

We note with interest the formation at Huntingdon, Que., of a medical society to be known as the District of Beauharnois Medical Association. It is, as implied in the name, a branch of the Canadian Medical Association, Quebec Division.

Dr. Clouston contributed a paper on First Aid in Frost Bite, which is appearing in our columns (p. 166), and a round-table conference was then held on the use of sulphanilamide. The keen interest of those present augurs well for the success of this society.

United States

The International Physicians' Luncheon Club of New York extends a most cordial invitation to physicians visiting New York to be honoured guests at an excellent international luncheon, at the same time offering the services of the members of the Club for any information they may desire.

While guests are not requested to make speeches, any useful information they wish to give informally will be greatly appreciated as fostering medical progress and international goodwill among physicians from all over the world. Luncheon is served at the International Medical Centre, 135 East 55th Street, New York, every Tuesday punctually at 1 o'clock and is over about 2 o'clock. Physicians are requested to inform the Club of their presence not later than 9 a.m. Tuesday by telephoning Wickersham 2-7900, or writing International Physicians' Luncheon Club, 135 East 55th Street, New York.

The Transactions of the

Third International Goiter Conference

held under the auspices of

THE AMERICAN ASSOCIATION FOR THE STUDY OF GOITER

WASHINGTON, D. C., 1938

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GOITER PUBLICATIONS

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Publishers of the annual transactions of the American Association for the study of Goiter since 1930

The College of Physicians of Philadelphia awarded on July 14, 1938, the Alvarenga Prize to Dr. Richard E. Shope, of the Rockefeller Institute for Medical Research, Princeton, N.J., for his recent brilliant researches on the etiology and epidemiology of influenza.

This Prize was established by the will of Pedro Francisco deCosta Alvarenga, of Lisbon, Portugal, an Associate Fellow of the College of Physicians, to be awarded annually by the College of Physicians on each anniversary of the death of the testator, July 14, 1883, to the author of the best memorial or unpublished essay upon any branch of Medicine, which may be deemed worthy of the Prize.

The New York Polyclinic Medical School and Hospital.—A special department of Facial Palsy has been established for teaching purposes, with clinics every Thursday at two o'clock. This department is in charge of Dr. Thomas G. Tickle and his staff.

General

The Banting Research Foundation

The annual report of the Banting Research Foundation for 1937-38 discloses that its income of last year was directed into two main channels. First, a substantial portion of it was used to pay salaries to, and purchase materials for, twelve research workers selected by Sir Frederick Banting. Working under his direction on problems in the Department he heads, these persons are engaged on twenty-one different investigations. The second and somewhat larger portion of the Foundation's income was distributed to twenty-four different applicants who are working in various universities and hospitals throughout Canada. These submitted research problems to the Foundation which met with the Trustees' approval. Analysis of these applications shows that financial assistance was requested for four separate purposes, (1) salaries for full-time research, (2) salaries for part-time research, (3) salaries for helpers or assistants, and (4) materials and equipment only. The first three types of grants frequently contained some provision for materials and equipment as well as salary. The problems under investigation by these applicants embrace a wide field of medical research. Following is a list of the applicants receiving aid, the place where the work is being carried out, and a brief statement of the problem under investigation.

B. F. Crocker, Department of Biochemistry, University of Toronto, having developed a surgical technique to obtain samples of food after it has passed through any part of the gastro-intestinal tract of a living animal, is using it to study the digestion of different food stuffs. E. W. McHenry, School of Hygiene, University of Toronto, is studying the physiological action of vitamin C by feeding animals a controlled amount of food with and without vitamin C. R. W. Begg, Department of Pathology, Dalhousie University, Halifax, is making an extensive study of the sedimentation of erythrocytes. He is investigating the causes of errors in technique and endeavouring thereby to improve it. He is correlating his results with clinical findings to see if the chemical cause of the altered sedimentation rate can thereby be determined. E. M. Boyd, Department of Pharmacology, Queen's University, Kingston, is pursuing his studies on the water-balance hormone of the pituitary body. Maria Sergeyeva, Department of Physiology, McGill University, is investigating the effect of both resection and stimulation of nerves on the structure of islet cells in the pancreas as well as the effect on their structure obtained by the injection of choline, secretin and eserine. B. Rose, University Medical Clinic, Royal Victoria Hospital, Montreal, is studying the effect of cortin and histaminase on the disappearance of histamine in the adrenalectomized rat, and is also making further studies on the liberation of histamine by using the kidney instead of blood as an index. M. J. Miller, University of Saskatchewan, is determining the distribution of human parasites in mid-western Canada. G. L. Bateman, Department of Physiology, Queen's University, is ascertaining the occurrence of acetylcholine in the placentæ of animals and investigating its action, particularly with regard to a possible rôle in labour. E. W. McHenry, School of Hygiene, University of Toronto, is following another aspect of vitamin C research by paired feeding experiments. E. A. Ryan, Department of Biochemistry, University of Toronto, is investigating the physiological significance and chemical structure of a new compound, probably related to the sterols, which is excreted by normal humans. A. D. Odell, Department of Biochemistry, University of Toronto, is attempting to synthesize the progestational hormone or a possible substitute for it by the chemical degradation of an easily procurable bile acid. K. W. Saunders has been delayed by illness in investigating the possible distribution of arsenic in well water in certain parts of Ontario when wells are drilled through limestone strata. The chemical work is to be performed in the Preventive Medicine Laboratories of Queen's University. C. H. Walton, Faculty of Medicine, University of Manitoba, is, with Dr. M. Dudley's help, making a thorough pollen survey of Manitoba. K. W. Baldwin, Department of Anatomy, University of Toronto, is studying with A. W. Ham the fate of alveolar epithelium as the lung passes through various stages of embryonic development. A new injection method used in this study promises to be of material help in reaching a decision as to whether or not the alveoli of the adult lung possess a complete epithelial lining. D. W. G. Murray, Department of Surgery, University of Toronto, is continuing clinical studies regarding the effects of heparin on patients. H. T. Malloy, Royal Victoria Hospital, Montreal, is studying congenital hæmolytic jaundice in the rat and man. In this work the biochemical aspect of the problem will be emphasized. H. B. Collier, Department of Biochemistry, University of Toronto, is pursuing researches on the enzymatic synthesis of protein, the normal protease of animal tissue is being studied particularly. W. J. Auger, Hospital for Sick Children, Toronto, having devised a superior method for obtaining sputum from children suffering from pneumonia, and having found that about 40 per cent had type I pneumococcus in their sputum, is continuing the study with the hope of being able to use serum therapy to see if the incidence of empyema can be reduced in these cases. D. L. Selby and R. W. I. Urquhart, both of the Department of Pathological Chemistry, University of Toronto, are continuing their studies of experimental nephrosis, using an ingenious technique which they have recently described. E. E. Kuitunen, School of Hygiene, University of Toronto, is making a survey of the distribution and type of intestinal parasites in Toronto children. D. G. MacDonald, School of Hygiene, University of Toronto, is studying, in cooperation with Dr. A. A. Fletcher, the action of the B vitamins on intestinal tonus, and also the cause of bradycardia which occurs in B_1 deficiency. B. Schachter, Department of Biochemistry, University of Toronto, is investigating the nature of a compound in pregnant mare's urine to see if it is an œstrogen derivative, a matter of importance in understanding the metabolism of œstrin. M. M. Hoffman, Dalhousie University, Halifax, is determining the physiological properties of an unidentified ketone in pregnant mare's urine. P. G. Weil, University Clinic, Royal Victoria Hospital, Montreal, is pursuing biochemical studies on the metabolism of progesterone, investigating the sterol metabolism in the toxæmias of pregnancy and studying a new sterol in the urine of pregnant women and the urine of newly-born children, with reference to the adrenal cortex.

The Trustees were pleased to note that over thirty reports of investigations performed with the help of the Banting Research Foundation appeared in various journals last year. More gratifying than the number of contributions was the definite evidence many of them afforded to prove that several of the most obstinate of man's ills are slowly yielding to the advance of medical science. This knowledge, it is hoped, will prove a source of satisfaction to those who showed their appreciation in a material way for Sir Frederick Banting's contribution

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to medicine by endowing a Foundation, not only to assist Sir Frederick in his further researches but also to allow other workers of this country to follow up projects of merit. The Foundation reminds all who wish to carry out medical research in Canada that its function is to prevent meritorious projects from perishing because of lack of funds.

V. E. HENDERSON,
A. W. HAM,
Honorary Secretaries.

Book Reviews

Sir Thomas Roddick. H. E. MacDermot, M.D. 160 pp. $1.50. Macmillan, Toronto, 1938.

Fifteen years after the death of Dr. Thomas George Roddick Dr. H. E. MacDermot has given us an admirable account of one of the most brilliant and versatile careers in the history of Canadian medicine. The story is told clearly and pleasantly; attention is focussed upon those phases of his experience which developed his unusually varied abilities to their highest exercise.

Roddick's work as hospital surgeon and teacher began when Listerian antiseptic principles were rarely understood and but half-heartedly attempted. Roddick became one of their most enthusiastic advocates, especially after he had met Lister overseas and observed his methods. He was a born surgeon, happy in his work, and most stimulating as a bedside teacher, deeply interested in the personalities of his students. Anyone who fell in with patients of Roddick's could not but be impressed by the almost worshipful affection they showed by word and countenance.

The Riel rebellion of 1885 suddenly laid upon Roddick's shoulders the serious task of organizing medical services in connection with the three attacking columns, widely separated, and working in a terrain mostly wilderness. His powerful physique stood him in good stead, and his clear head and cheerful spirit carried him lightly through a very difficult time.

In chapter five, Dr. MacDermot sets out very clearly the history of the long struggle to establish one portal of entry to the practice of medicine in the Dominion of Canada. From 1894 till May, 1911, when the "Roddick Bill" received final assent in Parliament, the matter was never out of Roddick's mind for long. To this end he entered parliament and endured the multitudinous annoyances which that involved in the life of a busy surgeon and teacher. It was the one thing the students complained of in their relation to "Tom". He was gifted with so many of the qualities essential to the successful performance of this task that without his patient tact, humorous tolerance in the face of nagging objections and delays, and tireless persistence, the desired haven might not have been reached so soon.

The idea that enters the mind even of one who did not know Dr. Roddick intimately is that of a man so wholesomely related to life in its infinite diversity as to be ready and happy in all circumstances, living "more in the broad sunshine of life than any man", as Samuel Johnson said of Richard Mead. No art was necessary "to find the mind's construction in (his) face". Power, balance, capacity, kindly humour, invited the fearless approach of people of all ages and conditions, surely a god-like virtue in this difficult world!

Those wise old Hippocratic scriptures are fond of telling the budding Asclepiad what sort of person a worthy physician should be. "The dignity of a physician," say they, "requires that he should look healthy and as plump as nature intended him to be. He must be clean in person, well dressed, pleasing to patients, careful of moral considerations, of a serious but not a harsh countenance. In all social relations he will be just. He must have at command a ready wit. He must have a care for a well-arranged equipment." Judged by the clear-sighted realism of these ancients, Tom Roddick, as all his friends called him, would have made very high marks. Canadian laymen, as well as the beloved fraternity, owe Dr. MacDermot "much thanks" for this, which was, no doubt, a labour of love.

Symptoms and Signs in Clinical Medicine. E. N. Chamberlain, M.D., M.Sc., F.R.C.P. 2nd ed., 435 pp. illust. $7.50. Macmillan, Toronto.

The author describes the various clinical and laboratory procedures which are used in performing a routine medical examination, illustrating by photographs and drawings. He discusses the anatomical, physiological and pathological background, and gives, as well, a short account of the important medical diseases pertinent to each system. The routine of examination as laid out is thorough, the text is clear and concise, and the photographs are plentiful and well reproduced.

The perfect textbook on the subject will never be written. Differences of teaching methods from centre to centre preclude that possibility, but there is an element of sound common sense running through this book that should give it an unusually wide appeal. It is remarkably free from padding. The subjects for the illustrations have been carefully chosen. (It is a relief, incidentally, to find a book on this subject which is not cluttered up with unnecessary pictures.) The discussion of the pertinent medical diseases is done unusually well and should make the volume of interest to practitioners as well as students.

There are, however, certain errors. For instance, the author, in speaking of stethoscopes, fails even to mention the diaphragm type which to anyone interested in the physics of auscultation is a regrettable omission. The classification of adventitious sounds in the lung is laboured and confusing; for example, to attempt to differentiate between "crackling râles" and "crepitations" seems unnecessary. Some of the coloured illustrations could well be omitted. The book, as a whole, however, is decidedly a good one and is deserving of wide attention.

The Form and Functions of the Central Nervous System: An Introduction to the Study of Nervous Diseases. F. Tilney and H. A. Riley. 3rd ed., 851 pp., illust. $10.00. Paul B. Hoeber, New York, 1938.

The new edition of this standard textbook of Neuroanatomy will be welcomed by all students of Neurology. In the fifteen years since the second edition of "Tilney and Riley" appeared, many new facts have been added to our knowledge of the structure and functions of the nervous system. While the authors have been conservative in their choice of new material and in their bibliography this is perhaps inevitable in revising any standard textbook. New sections have been added to the chapter on the Elements of the Central Nervous System, to include work of Hortega, de Castro, Penfield and others. The sections on structure and functions of the cerebral cortex, and the hypothalamus have been brought up to date. A simpler nomenclature for the cerebellum has been adopted.

The general scope and arrangement of the book remains unchanged. The comparative anatomy and embryology of the nervous system are emphasized, and there are useful chapters dealing with disease syndromes. The new volume is smaller, better bound, and costs less than the older edition. The illustrations are distinctly improved, though some of the drawings, and the photographs of gross brain sections could be clearer.

This book is highly recommended as a reference work for the advanced student of neurology and for the clinical neurologist and psychiatrist.